# Heating and Ventilating

Volume 29 JUNE, 1932 Number 6

## CONTENTS

Frontispiece—Night View of Cities Service Building ..... 22
A Hot Water Heating System for a 67-Story Building ..... *J. A. Space* 23
Use of Steam Jets for Smoke Abatement ..... *Arthur C. Stern* 29
Controlling the Ventilation of the Holland Tunnel ..... *A. C. Davis* 30
Data on Water Temperatures for Refrigeration ..... 34
What's New in Small Building Practice
I. The Modern Radiator ..... 36
II. Modernizing a Gas-Fired Warm-Air Plant *J. Donald Kroeker* 40
District Heating Moves Ahead ..... 43
Rockefeller Center, Part III,
Air Conditioning the International Music Hall ..... *Andre Merle* 47
A.I.A. Committee Condemns Present Ventilation Standards ..... 51
Making the Rounds with a Service Man, Part II ..... *V. D. Milliken* 52
Editorials ..... 55

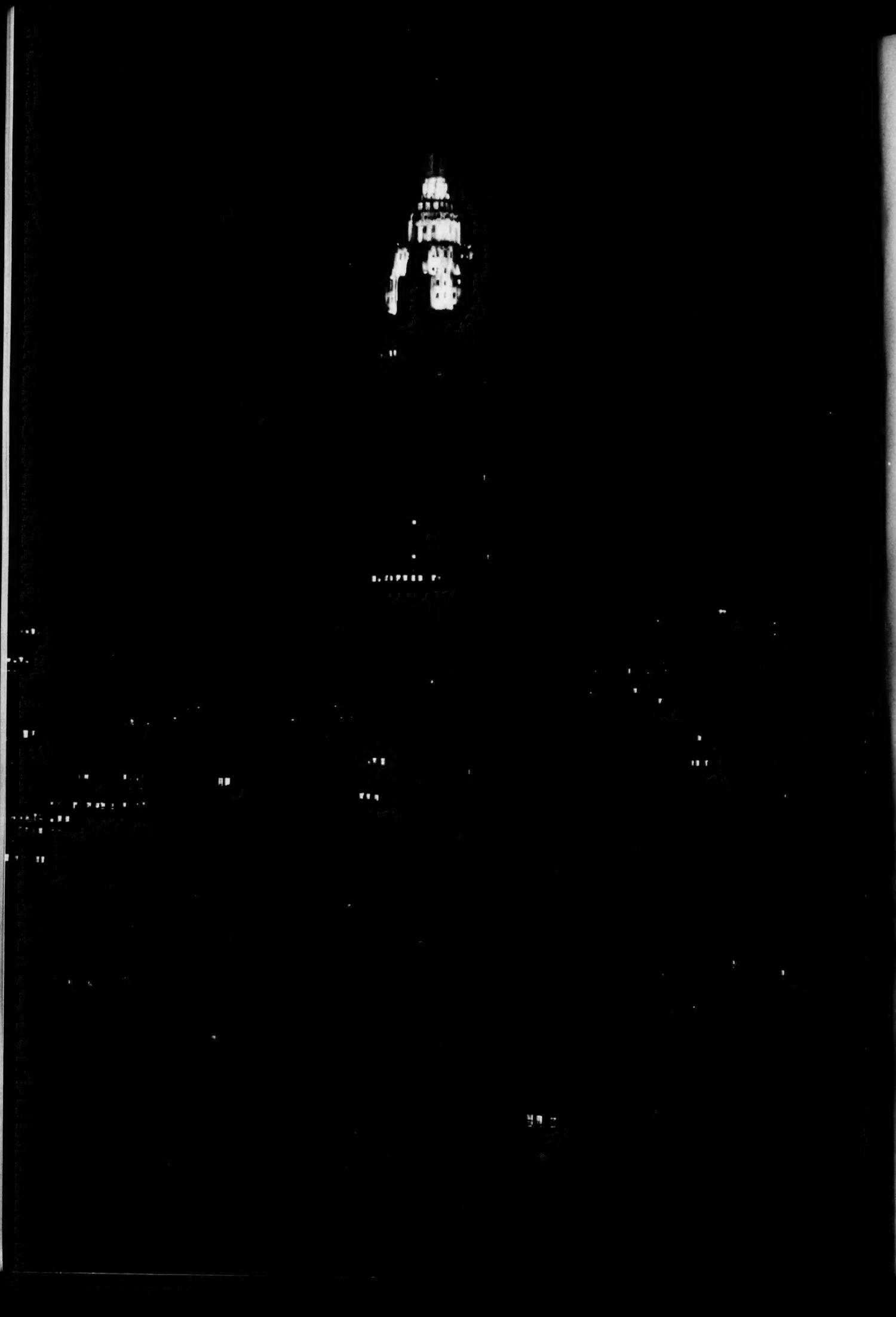
## DEPARTMENTS

Abstracts ..... 56
Your Everyday Problems ..... 60
News of the Month ..... 62
New Equipment ..... 72
Business Statistics ..... 82
With the Manufacturers ..... 84
Degree Days for April, 1932 ..... 90
The Weather for April, 1932 ..... 92

Published Monthly by
THE INDUSTRIAL PRESS, 140-148 LAFAYETTE STREET, NEW YORK

ROBERT B. LUCHARS, President EDGAR A. BECKER, Vice-Pres. and Treasurer ERIK OBERG, Secretary
C. H. B. HOTCHKISS, Editor CLIFFORD STROCK, Associate Editor
CLIFF W. PRESDEE, Advertising Manager GEORGE G. TURNER, Western Representative JOHN F. HYDE, Eastern Representative

Subscription, $2 per year in United States and Mexico, $2.50 in Canada. $3 all other countries. Single copies regular issue, 30 cents.



# A Hot Water Heating System for a 67-Story Building

**The radiators, enclosures, and unit ventilators**

By J. A. SPACE†

ON Friday, May 15, the recently completed office building known as Sixty Wall Tower, located at 70 Pine Street, in New York, was officially opened. This latest addition to the Manhattan skyline, extending some 950 ft. above street level, towers above the whole financial district to dominate the southern portion of the island. Because of its ownership, this 67-story structure has been popularly known as the Cities Service Building, and with its gross floor area of 1,045,000 sq. ft. properly takes its place among modern office buildings of the first rank.

**Our frontispiece this month shows a striking night view of the new 950-ft. office building—third highest in New York—commonly known as Cities Service Building, but officially named Sixty Wall Tower. The many modern engineering features included have made this building much talked about among engineers. Not the least of these are the innovations in heating and ventilating, which include use of a hot water heating system and an unusual arrangement of radiators, enclosures, and unit ventilators.**

The careful study given to its design and construction has resulted in the introduction of many ideas, new to buildings of this kind and productive of increased operating efficiency. Competent engineers have controlled every stage of its design, so that structural, electrical and mechanical features represent the most modern practice based on present-day economic considerations. It houses the first installation of double deck elevators ever to be made, and in addition uses five pairs of reversible escalators with a capacity of 6,000 passengers per hour to serve its more densely populated lower floors. Low tension electric current for power and light is distributed over a system of tubular conductors, constituting a distinct innovation from previously accepted standard practice.

Not the least among the outstanding features of this building are the use of hot water for heating and the employment of extended surface type radiators. In the heating profession, widespread interest has been aroused by these innovations and their consideration is therefore quite timely. A complete description of the installation, as well as a discussion of the principal considerations prompting the use of its many features, will be the subject of an article to appear in an early issue of this magazine, the present discussion being limited in scope to a description of the radiation and enclosures employed.

## Radiators

The heat emitting apparatus and the arrangements made in connection with its installation and operation are among the most unique and interesting features of this building. For such direct heating as is provided for the first floor and below, low pressure steam is used and regular cast iron radiators are employed. All of the building above the first floor gets its heat from hot water circulating systems, and for this portion the heating surfaces are of the extended surface variety, consisting of finned tubes expanded into cast iron heads.

In selecting the materials of which any heating surface is to be constructed, consideration must be given to working pressure, rate of heat transfer and cost. The maximum pressure to which any radiator of such a hot water system will be subjected corresponds to the static head under which it is placed, and due to the fact that this system is divided into four zones vertically the maximum head on any radiator is approximately 115 lb. per sq. in. Since water temperatures are very moderate it is quite apparent that no extraordinary materials are required to cope with the conditions imposed. Figures on the heat conductivity of copper and brass as compared with other metals are well known to all, and when we consider the prices at which these metals have been available, the choice of copper made up into radiators of extended surface type is easily understood.

The radiator units as built and installed consist of cast iron headers into which have been rolled the ends of finned copper tubes, the tubes being ¾ in. outside diameter, and the finned surface consisting of a continuous strip of copper spirally wound around and metallically attached to the outside of the tubes. The strip makes seven turns per inch, and the outside diameter of the fin is 1½ in. The actual surface per lineal foot of tube is 1.52 sq. ft.

The use of hot water as a heating medium gives the engineer more freedom of design, by giving him control of a variation in the rate of heat transfer for the tempering surface; this is not the case when steam is contained within the radiator. That the rate of heat emission of radiators depends upon the mean temperature differences is known, but some are prone to forget that, when steam is the heating medium, the coefficient of heat transfer of the surface of a radiator surrounded by room air of a given temperature—say 70° F.—is a

†Designing Engineer, Henry L. Doherty and Company, New York.

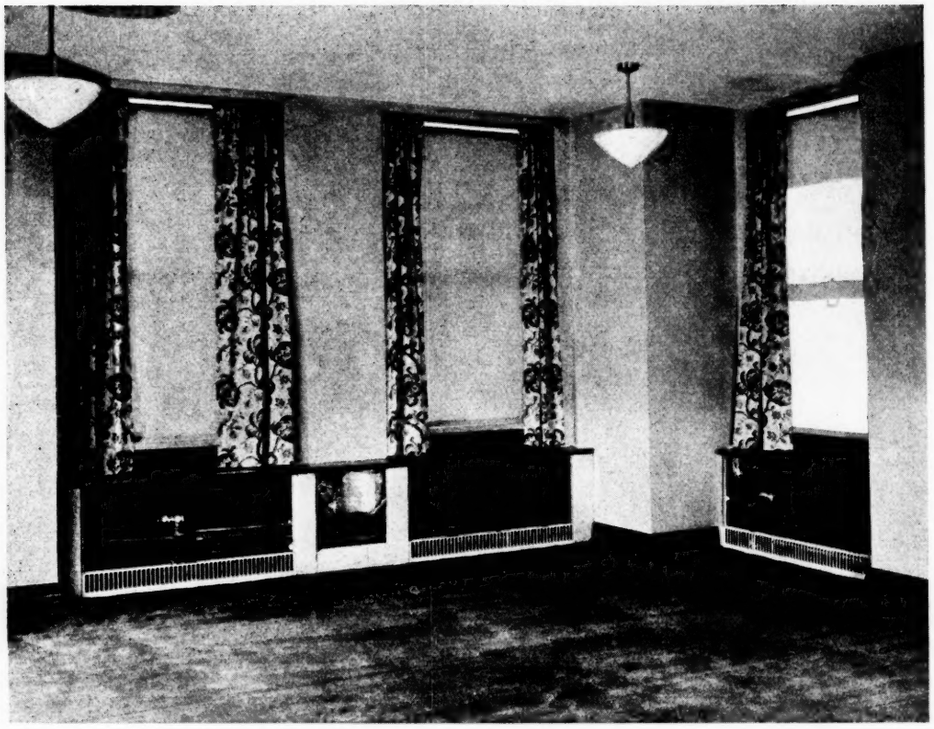


**Fig. 1. Showing an installation in both single and double window bays of finned tube radiators. For this photograph enclosure doors were removed to show interior details.**

fixed quantity aside from the slight variation which can be obtained by changes in the vacuum. This is not the case with hot water heat because a change in the velocity of the circulating water causes not only a variation in the water temperature difference, but also a change in the heat transfer because of the variation in the temperature difference between the metal and the surrounding air. In order to determine the amount of surface which would be most economically employed, it was found necessary to arrange the tubes in such a way that a considerable drop in temperature was obtained for each radiator; in other words, to arrange for series flow through several passes, thus keeping the amount of circulating water to the minimum consistent with good engineering. When we consider the effect of this item on all pipe sizes, its importance cannot be overstressed. Accordingly, each radiator is arranged to have three passes for the water, the entrance being at the top in each case to take full advantage of the counterflow principle. Surfaces have been so proportioned as to maintain 70° in the building when the outside temperature is 0° with a 30° drop in the temperature of the circulating water.

The amount of actual surface required for any particular radiator was determined in the usual manner, and following the usual practice, radiators have been disposed around the outside walls under windows to eliminate downdrafts. In such locations as required a relatively small amount of surface under a comparatively wide window, it was deemed expedient to use radiators of a narrower design to cause a resulting increase in radiator length and thus more effectively take care of the heat distribution. As a result, two standard widths of radiator were adopted; one employing a total of 11 tubes arranged 4-3-4 and occupying a width of 8 in., the other being made up of eight tubes arranged 3-2-3 and occupying a width of 5½ in. In each case water is supplied to the top header and passes the length of the radiator through the top row of tubes. It then returns through the second row of tubes and reverses once more to traverse the bottom row to the outlet header. In the case of the 11-tube radiator, the flow is first through the top four tubes, then through the three in the second row, and finally through the four in the bottom row. The eight-tube radiator is, of course, the same as the larger unit except that one tube has been omitted from each horizontal row. Due to the location of zone risers at opposite ends of each bay of the building, the use of the odd number of passes placing supply and return headers at opposite ends of the radiator was highly desirable.

The combination of finned copper tubing and internally baffled cast iron heads resulted in a comparatively light and very compact unit, which is much easier to handle than a radiator of equal capacity of the ordinary type; however, strength has not been sacrificed to obtain lightness of weight, for each radiator is built to withstand a static water pressure of 700 lb. per sq. in. The accompanying illustrations show several sizes of radiators in their enclosures, and it is worthy of note that the surface used in each bay is disposed most effectively to accomplish the desired distribution.

It is also worthy of note that all of the surface required in any bay of the building is made up in a single radiator except in cases where the lengths would be such as to cause unnecessary hardship from the standpoint of manufacture, shipping and handling. In most buildings, the heating surface for a two-window bay would consist of two radiators disposed under those windows. In this building, the surface required for the determined losses is similarly disposed, but a departure from a standard practice is to be found in the fact that the tubes are continuous, resulting in the installation of a single radiator unit which places under each window the surface required and also provides extra surface located in the central part of the enclosure and separated from the other by vertical baffles in the enclosure. This departure from standard practice became desirable because it was found to be more economical

to provide this extra surface than the added connections and valves which would be required for a multiple radiator installation.

There are substantially four different types of installation, all of which are illustrated by the accompanying photographs:

A single short radiator located in a narrow bay which contains a single window, as shown at the right of Fig. 1.

A single long radiator located in a wider bay which contains two windows under which the radiation is disposed, is shown at the left of Fig. 1.

Two radiator sections located in a very wide bay which contains three windows under which the radiation is disposed, as shown in Fig. 3.

Two radiator sections located in a very wide bay which contains two windows and a door leading to a roof terrace, as shown in Fig. 4. (Note that the radiator and enclosure installation is divided into two parts by the door.)

## Radiator Connections

The zone risers—both supply and return—which take care of the vertical distribution of water between the floors making up any one zone, are furred in to the spaces at the building columns; steel tees are provided where required in these risers, and connections to the radiators are brought out through the furring at the enclosure ends. The result is a completely concealed installation, a very desirable feature for buildings of this type. One inch pipe is ample to carry the quantity of water required for the largest radiator; most of the run-outs, however, are ¾ in. The use of small radiator connections presents distinct advantages; not only are they very desirable from the standpoint of cost, but they also make possible the use of highly advantageous bends which provide flexibility and eliminate fittings and joints to help minimize the possibility of leaks. Fig. 1 shows very plainly the supply connections in the form of hairpin bends, which, on account of their length and the small diameter of pipe employed, permit considerable movement of the risers without any corresponding movement of the radiator or strain on the joints. The connection from the opposite end of the radiator to the return riser is of a similar design and employs another hairpin bend. In cases like those shown in Figs. 3 and 4, where two radiator units are within a common enclosure, a single connection comes into the enclosure space from the zone riser tee to be later divided within the enclosure and employ flexible connections to the individual radiator headers. The photographs make it quite apparent that flexibility and freedom from strains have been properly considered in this installation. All unions and fittings (where used) in the radiator connections are of forged steel; pipe is of seamless open hearth steel, and valves are extra heavy brass of globe type. The inlet valve alone is equipped with an indicator to show the relative valve opening, a desirable feature for balancing a hot water system and equalizing the flow between radiators.

Not only are there unions installed between the hairpin bends and the risers, but valves have union connections for the joints where they make up to the radiator headers, all of which reduces to minimum the labor which would be required for the removal of any radiator.

## Enclosures

Utility, cleanliness, and beauty of appearance are items of paramount importance when consideration is given to the subject of radiator enclosures. Modern requirements have established rigid standards of excellence in this regard; the realization that business men spend at least as many of their waking hours in their offices as in their homes has nurtured the realization that careful attention to all details concerning office space is of great aid to those charged with the responsibility of renting it. The unsightliness of the old-time

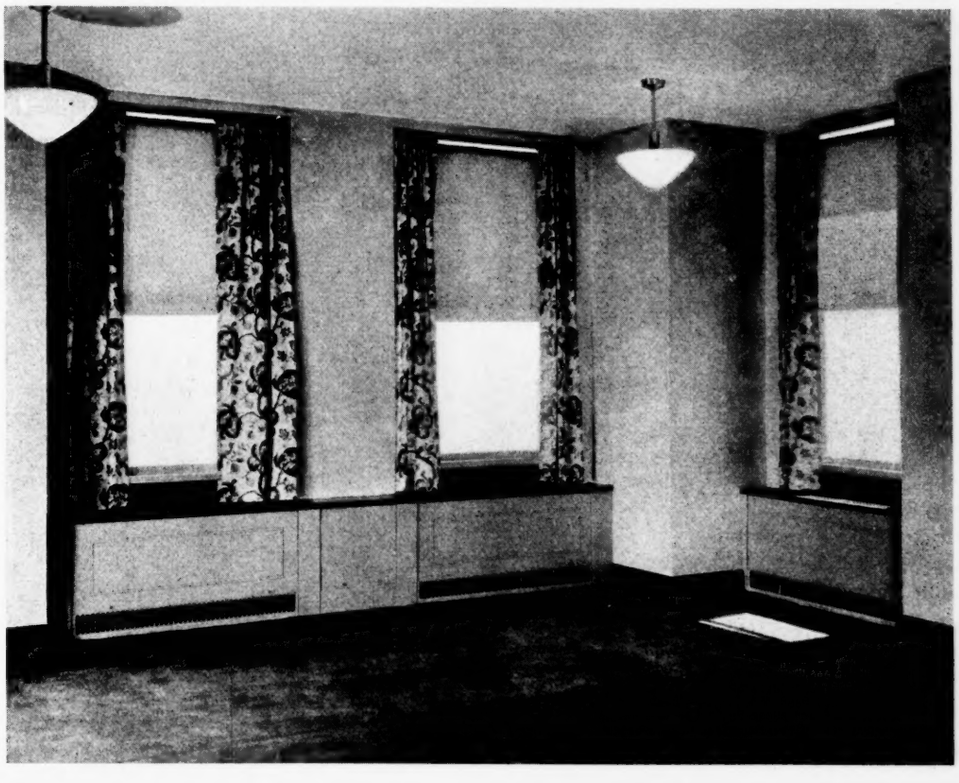


**Fig. 2. This is a duplicate of Fig. 1 except that enclosure doors are all in place to show the external appearance of the units.**

heating installation has been one of its greatest drawbacks; the ability of the average radiator installation to catch and accumulate dust and dirt has made it an eyesore for tenants and, consequently, a bugbear for owners.

Fig. 2 vividly shows the manner in which past objections have been answered. Short and long enclosures are both illustrated in this corner of the building. Unsightly corners, with their possibilities for dirt accumulation, have been eliminated by extending the enclosure continuously from column to column. The occupant of such office space can forget entirely that radiators exist and, as the photograph shows, not the least of the advantages of such enclosures is the manner in which they can be blended into the other decorative features of the office.

The enclosures may be divided roughly into two general classes; those for non-rentable space and those for rentable space. There are further sub-divisions of these general classes, made necessary by the variety of uses to which non-rentable space may be put and by the variables to be found in such physical characteristics as distance between columns, number of windows per bay, etc. All enclosures of all types in the hot water zones are of steel, regardless of their locations. In all cases the stools are of 12 gauge metal; fronts, posts and removable doors are formed from 16 gauge metal, and because of the form and dimensions of the parts, the enclosures are of exceptionally sturdy construction.

For such non-rentable space as machine rooms, tank rooms, etc., enclosures are similar to those illustrated except that their air outlet grilles are located in the front of the enclosure rather than in the top, and they are not fitted with controllable louvers. Such radiators as are installed in the fire tower stairways are enclosed in simple casings having perforated stools, but no bottoms forming, in effect, chimneys in the base of which the heating surface is located.

The proper application of enclosures to toilet radiators presents a little different problem from that which is encountered in the other parts of any building because of the semi-public nature of this space. The special requirements of this application have been admirably met by raising all toilet radiators and their enclosures approximately 6 in. above the floor and mounting them on a masonry support which is faced with tile of the same color as that used in the balance of the room. The use of this tile base is of advantage for the mopping and cleaning of floors, but results in the loss of a corresponding amount of chimney height which has been made up for by elevating the enclosure stools a corresponding amount, bringing them up to the approximate level of the window sills. These units, like those in other non-rentable space, have their air outlets located in the enclosure fronts near the top and are without louvers.

Two varieties of enclosures have been installed in the rentable space of the building, the scheme of ventilation determining the choice between the two. On the second, third and fourth floors, fresh tempered air is supplied to the interior space from a central system fan room, and the enclosed radiators disposed under the windows along the outside walls are required to furnish only such heat as is lost through the walls. For this space, enclosures are of a design similar to those illustrated except that the stools are set higher, bringing them to a level almost even with the window sills; the air outlets, equipped with louvers, are at the highest point of the fronts rather than in the stools, the increased height of the stool making it possible to use outlets in this location because the effective chimney height of the enclosure is maintained.

## Unit Ventilation

In order to appreciate properly the features of the second variety of enclosures for rentable space—and incidentally the accompanying photographs show only enclosures of this type—it is necessary at this point to call particular attention to one of the most important innovations of this building, the provisions made for unit ventilation. When tall structures of this type are de-

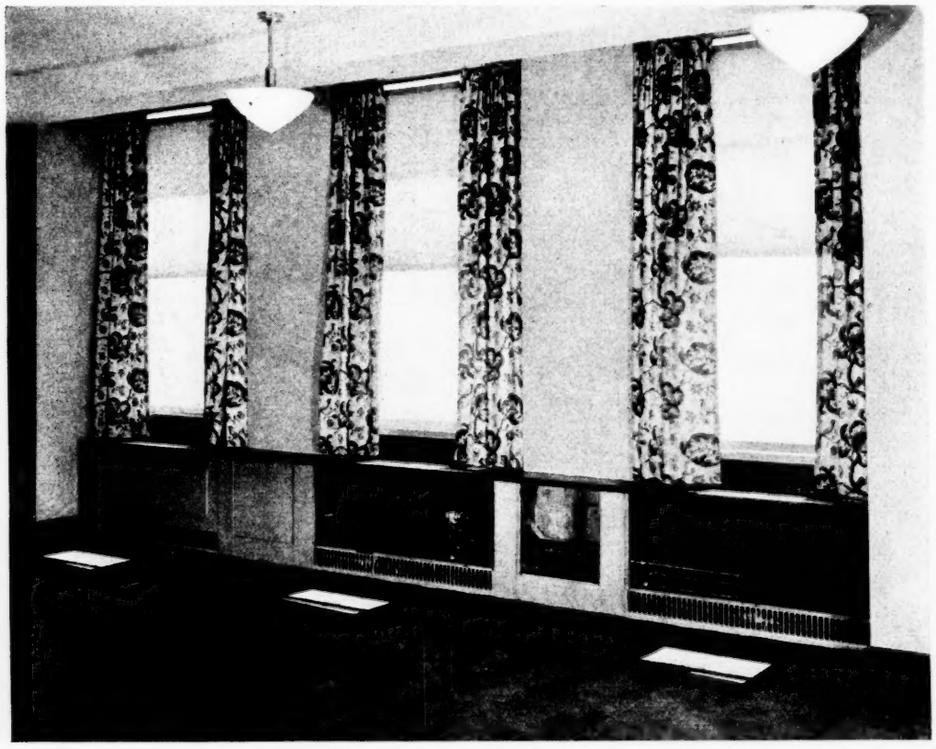


**Fig. 3. Showing the installation in a triple window bay with some enclosure doors removed. Note that heating surface is in two radiators with the same amount of surface under each window.**

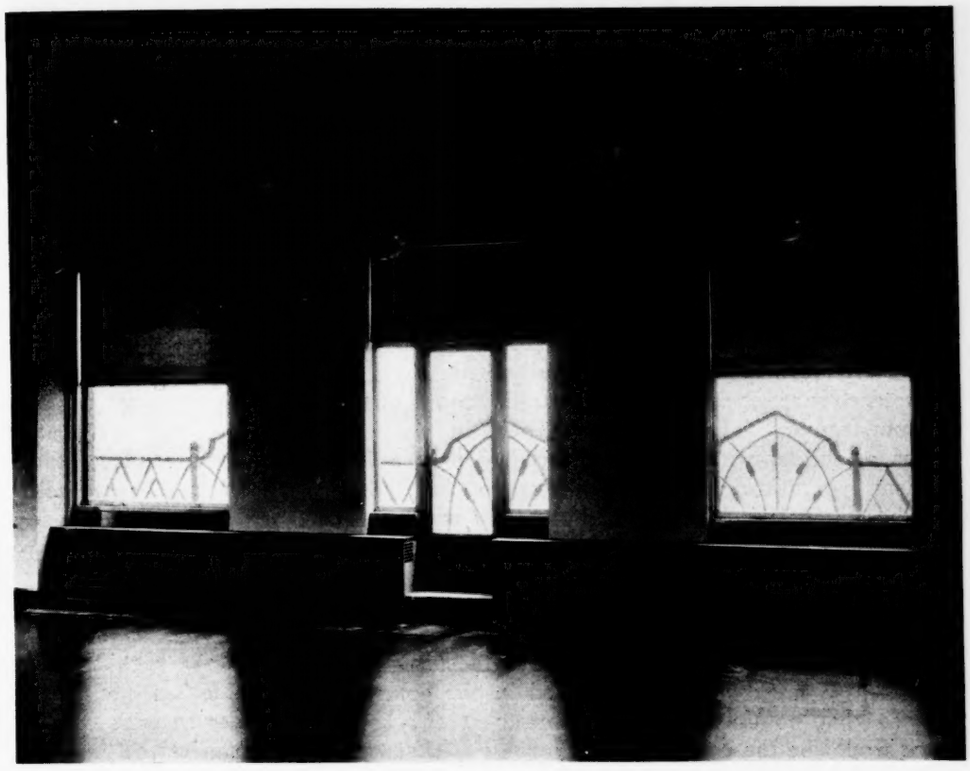


**Fig. 4. Showing the installation of radiator sections and enclosures where doors to roof terraces are used — for this photograph doors were removed from only one half of the enclosure.**

signed there is always a question as to how far plans for forced ventilation should be carried, the expense involved generally being the limiting factor. After much careful consideration it was decided to provide a central ventilating system for all floors below the fifth, as mentioned above. It was also found to be very desirable and, what is more important, economically possible to make provisions in the building construction which would permit of possible future ventilation of the balance of the building with the use of small motor-driven fans.

With this thought in mind, the building has been equipped throughout with hollow metal window sills of such dimensions and arrangement that dry type filter pockets can be inserted in them as required after removing light temporary zinc sealing pans. The part of these sills which extends beyond the building is open to the air on the under side so that there is no danger of rain beating in, and at the same time permitting air to be drawn right through the filters into the building after the removal of the sealing pans referred to. The steel frame which forms the skeleton for any metal sill is equipped with lugs to which the enclosure back and stool can be attached; these points of attachment coupled with the support obtained from the floor give to all enclosures an exceptional amount of rigidity and insure the accurate location of all component parts. Each brick pilaster between the windows of any bay has been so constructed as to contain a vertical duct of approximately 120 sq. in. area and extending from floor to ceiling. This duct has been obtained by omitting furring tile for the desired width in the center and forming a cover over this chase with metal lath and the regular coats of plaster.

These window sill, filter, and vertical chase provisions have been incorporated into the construction above the fifth floor so that, whenever desired, any office space can be given a forced supply of fresh air with a minimum loss of time and with very little expense. When such ventilation is desired it is only necessary to remove an access plate for the placing of the filter pocket, slide a small motor-driven fan unit into the space provided for it in the enclosure, and connect a register into the vertical duct for admitting the fresh air into the room near the ceiling line. If it is desired to supply this air at points removed from the outside walls or into interior rooms, as is sometimes the case, it is necessary to construct only a small auxiliary duct from the wall chase to the desired point.

To make such complete provision for this highly important item of forced ventilation throughout the entire building required that certain features be incorporated in the radiator enclosures, features which are, however, highly desirable in any such unit. Each enclosure is provided with a light gauge sheet metal back attached to the floor along its bottom edge and to the enclosure stool and window sill lugs at its top. This back is set away from the brickwork of the spandrel walls approximately 2 in., which provides an air space in this location; a coating of heat insulating material applied against the waterproofing of the spandrel walls adds its insulating value to that of the air space, to keep at a minimum the loss of heat at this point. When a unit ventilator is installed, the 2 in. air space serves as a passage for the fresh air which has been drawn in through the filters and conducts it downward and toward the center of the enclosure where a balanced damper, located in the sheet metal back at a level near the floor, admits it to the chamber immediately below the finned heating surface.

Vertical baffles located at the posts separate the central chamber of the enclosure from the end compartments under the building windows and, as mentioned above, the heating surface located in this central chamber is extra surface, not needed to make up for convection losses but available for tempering the fresh air which can be drawn into this chamber in the manner described. To the under side of the stool in this central section of each enclosure there are attached Z-

bars so arranged as to form a shelf to support the small fan units referred to. Because of the area of the passages and the relatively low velocity, only a slight amount of suction is required of the fan. Figs. 1, 3 and 4 very plainly show the central compartments in which the fans can be placed as well as the other features described here.

Access to the filter pockets is obtained through removable plates which extend vertically from the tops of the enclosure stools up to the metallic aprons of the window frames. These plates are held in place by means of screws whose removal requires only a few moments, permitting complete access to the hollow chamber of the window sills and the easy withdrawal of the filter unit for the replacement of the filter medium.

The lowest members of all enclosure fronts are perforated with long slots of sufficient area to admit air from the room into the space below the heating surface. These members are embedded in the concrete floor so that no unsightly gaps appear at the base, which would be the case if the enclosure rested on top of an unevenly finished floor. The ends of the enclosures extend to a point just short of the furring blocks at the building columns and the finished plaster is brought against the enclosure metal in such a way that no unsightly cracks appear. The attachment of the access plates to the enclosure stools and window frames completes the harmonious arrangement which the photographs further emphasize.

**Sixty Wall Tower**

**Architects—Clinton & Russell, Holton & George. Consulting Mechanical Engineers—Tenney & Ohmes, Inc. Heating and Ventilating Contractors—Riggs Distler & Co., Inc.**

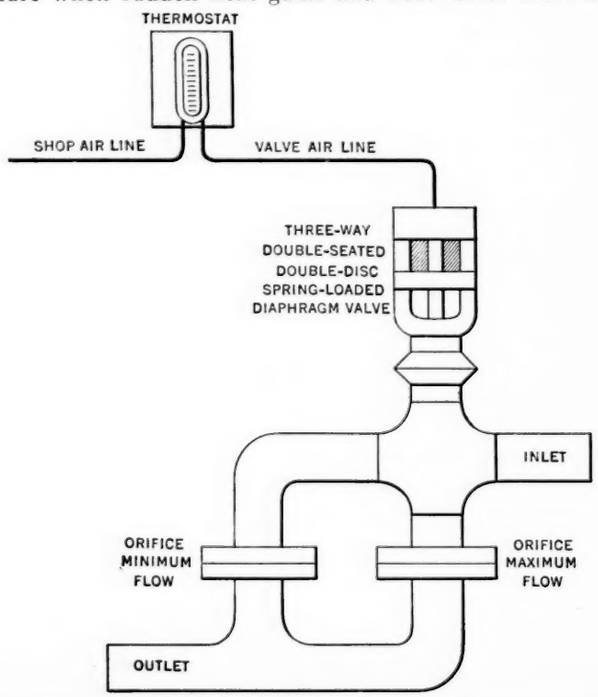
The photographs also show horizontal sheet metal baffles placed between the heads of the radiators and the ends of the enclosure compartments. These prevent the short-circuiting of air around the heating surface.

Fig. 4 shows the manner in which the engineers took care of the very special conditions encountered where doors were placed for access to the terraced roofs which occur at the setback levels. It can be seen that, in order to take care of any downdraft at the door, perforations have been provided in the end of each half of the enclosure adjacent to the door, thus setting up a circulation and delivering warm air to this point.

In view of its many innovations, it is easily understood why this latest addition to the Cities Service family has elicited so much favorable comment and merits to such a great degree the amount of interest shown by the heating and ventilating profession. Another article to appear in an early issue of this magazine will describe at some length the other interesting features of the heating and ventilation of this building.

## A Radiator Control Kink

THE accompanying sketch shows an inexpensive means of automatic control of heating systems that may be applied to an entire system, a group of radiators, or a single radiator. This means of control is not offered to supplant any means of control with which the engineer is familiar, but as a simple means of keeping an assigned space to be heated at a comfortable temperature when sudden heat gains and heat losses must be reckoned with, as in rooms housing manufacturing processes.




The valve used is a three-way, double-seated, double-faced disc diaphragm valve, which provides two flows, in this case a maximum and a minimum flow, one flow supplementing the other as called for by the room thermostat. It is available on the market as a drinking-water temperature control.

Two orifice plates meter the flow of steam. They are inserted inside of bolt holes of the pipe flanges.

The minimum flow may be proportioned as that amount of steam that is required to provide circulation in mild weather, or it may be any fraction of the design maximum flow thought to be necessary. The maximum flow should be about 20% greater than the design maximum flow to provide a quick pick-up.

Economical operation may be had by a studied application of the tapering action provided. This is especially noticeable in a vacuum return line system.

At maximum flow the need of steam is greatest, the pressure differential across the orifice plate is greatest, and steam flow is greatest. At minimum flow the need of steam is the smallest, and the pressure differential and flow of steam are the least. As the system condenses the steam and a vacuum is approached, the pressure differential and the flow increase. By plotting the Rateau curve as a K factor against the Moyer formula, the properties of the arrangement are determined and the size of the orifice plate openings may be calculated.

The orifice plates should be inserted as shown, so that the maximum flow of steam will be available should the air supply fail.—*William Anderson.*

# Use of Steam Jets for Smoke Abatement‡

By ARTHUR C. STERN†

THE smoke nuisance caused by improperly designed hand-fired furnaces burning bituminous coal may, to a certain extent, be abated by the use of steam-air jets to supply over-fire air and over-fire turbulence. This has been known since at least 1880, when the first devices of this type were patented and marketed. Since then almost every smoke abatement campaign has experienced a period during which steam-air jets were installed on a number of offending furnaces.

Steam-air jets are devices by means of which steam at boiler pressure is injected into the furnace through nozzles in such a manner that the steam serves to induce or aspirate a relatively large flow of high velocity air along with it. In 1927, at the Case School of Applied Science, DuPerow and Bossart thoroughly investigated the various elements entering into the design of steam-air jets. These elements included the effect of varying steam pressure, nozzle size, nozzle shape, nozzle location with respect to the air induction tube, air induction tube diameter, and air induction tube length. Their conclusions as to the most satisfactory design are now included in the design of the jet recommended and used by the smoke departments of Cleveland, Ohio, and Hudson County, N. J. (Fig. 1).

This design of jet, and in fact any design of simple jet, will not work very efficiently on less than 50 lb. gauge steam pressure. It was also ascertained that as the steam pressure applied to the jets was increased, both air entrainment and resulting turbulence increased until the pressure reached about 100 lb. gauge. Beyond 100 lb. air entrainment started to decrease rapidly. Therefore, it is advisable to throttle high pressure steam down to 100 lb. or less at the jet nozzle. Under these conditions of operation, this form of jet will induce about 20 lb. of air per lb. of steam, and will create an air velocity effective for turbulence (measured 3 ft. from the jet) of about 3000 ft. per min.

Current practice calls for the use of at least three steam-air jets per furnace, and as many more as are required by the empirical rule of one jet for every 200 sq. ft. to 250 sq. ft. of boiler heating surface. Jets placed on the furnace front wall are usually spaced on about 12 in. centers and are pointed to hit about 4 in. above the intersection of the grate and the bridgewall. In general, the placement of jets should be such as to cause maximum turbulence of the gases rising from the fuel bed. On the piping that connects the steam nozzles to the steam header, some provision must be made to eliminate condensation that is liable to form during the periods the jets are not in use. This may be accomplished by locating the quick opening valve near the header or by using steam traps.

In operation, jets are not used continuously unless they are installed to reduce smoke from a stoker-fired or chain-grate furnace. They are turned on just before firing, and are left on long enough to leave a clear stack after they have been turned off again. On several tests made, the interval during which jets were on averaged about 3 min. for each firing with bituminous coal containing about 20% of volatile matter. The time would increase with coal of higher volatile content. However, the efficiency of the jets as smoke-reducing devices would remain about the same.

Recently it was found desirable to obtain quantitative information as to the effect of using steam-air jets on overall boiler efficiency. The only information that could be gleaned from a search of the literature concerned two tests made at the University of Tennessee by Switzer in 1910. These indicated an increase of about 10% in boiler efficiency due to the use of the steam jets. The percentage of the total steam generated that is consumed by the jets, as usually reported, ranges from 5% to 15%.

Because the available data were so incomplete, the Department of Smoke Abatement Research of Stevens Institute of Technology sponsored several tests early in 1931 in conjunction with the Hoboken Marine Shops of the Pennsylvania Railroad. These tests were carried out under the direction of Col. Elliott H. Whitlock, and were run by Messrs. P. B. Christensen and O. R. Strahl in conjunction with the author. They showed that the amount of steam consumed by the jets amounted to between 1% and 2% of the total steam generated; or in these tests to about 0.05 lb. of steam per lb. of coal fired. The heat loss occasioned by bleeding this steam from the boiler and superheating it inside the furnace amounted to about 0.5% of the heat in the coal.

The best overall increase in boiler efficiency noted in these tests was about 10%, but the increase in efficiency that may be expected when jets are applied to any hand-fired furnace will not necessarily be the same, and will depend largely on the overall efficiency itself prior to their installation.

In these tests, no other attempt was made to increase the overall boiler and furnace efficiency, but it is firmly believed that with the same careful handling in both cases the addition of steam-air jets will allow operation of a poorly designed furnace at a higher overall efficiency, and materially reduce the smoke.

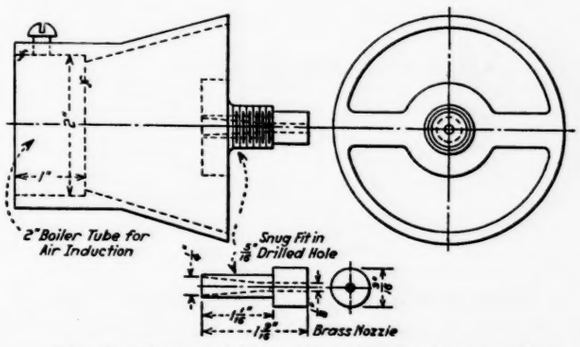



Fig. 1. Steam-air jet with self-cleaning nozzle

‡ From *Mechanical Engineering*, April, 1932.

† Department of Smoke Abatement Research, Stevens Institute of Technology.

# Controlling the Ventilation of the Holland Tunnel

By A. C. DAVIS†

**Years of study were devoted to the problem of vehicular tunnel ventilation before the Holland Tunnel was opened in November, 1927. The results of these studies have long been available, but little has been published regarding actual operating details (as distinguished from the design) of the ventilation system in this great project.**

**Questions such as these occur to the engineer: When the CO concentration in the tunnel becomes too high, do the fans start automatically, or are they always in operation? Does the fan system operate as a unit, or divided in sections? What happens when conditions in the tunnel approach the limit when it is considered advisable to supply more ventilation? What was the maximum CO concentration so far experienced?**

**In this absorbing article the author satisfies our curiosity regarding these and other such pertinent and practical questions.**

IN the ventilation of vehicular tunnels, consideration has to be given not only to dilution of the carbon monoxide gas produced by automobiles so as to make the tunnel air safe to breathe, but the system has to be designed so as not to create any longitudinal flow of air in the driveway that would increase the intensity of automobile fires, or cause flow of smoke through the tunnel. The ventilation system of the Holland Tunnel was designed with the foregoing requirements in mind.

This tunnel, owned and operated by The Port of New York Authority, lies between lower Manhattan, New York, at Canal Street, and Jersey City, New Jersey. It is the first vehicular tunnel to be ventilated by a transverse method of ventilation. It consists of two tunnels, one westbound from New York to New Jersey and the other eastbound from New Jersey to New York. Each tunnel accommodates two lanes of traffic on a 20-ft. wide roadway. Ventilation of vehicular tunnels is a very different problem from the ventilation of railroad tunnels.

Fig. 1 shows the ventilation system in use. The profile shows the relation of the tunnels to the river surface and bed, and also shows the ventilating buildings, two on each side of the river, in which the fresh air and exhaust air fans are located.

The major portion of the tunnel is circular, so that when a roadway and a ceiling are constructed there is a duct formed under the roadway and over the ceiling. These ducts are utilized for the supply of fresh air and the removal of foul air, respectively.

As indicated in the cross-section of Fig. 3, the air from the fresh air duct is taken off in flues at intervals, 10 ft. to 15 ft., into an expansion chamber which runs the full length of the tunnel on each side. The flues have adjustable slides at the top so that the proper quantity of air will be taken off at each flue. The face of the expansion chamber is an adjustable plate which can be adjusted so that at the time of maximum air supply the velocity through the slot will be 1000 f.p.m.

The fresh air enters the driveway on either side from the slot of the expansion chamber. This air comes in

†Assistant Superintendent, Holland Tunnel, New York.

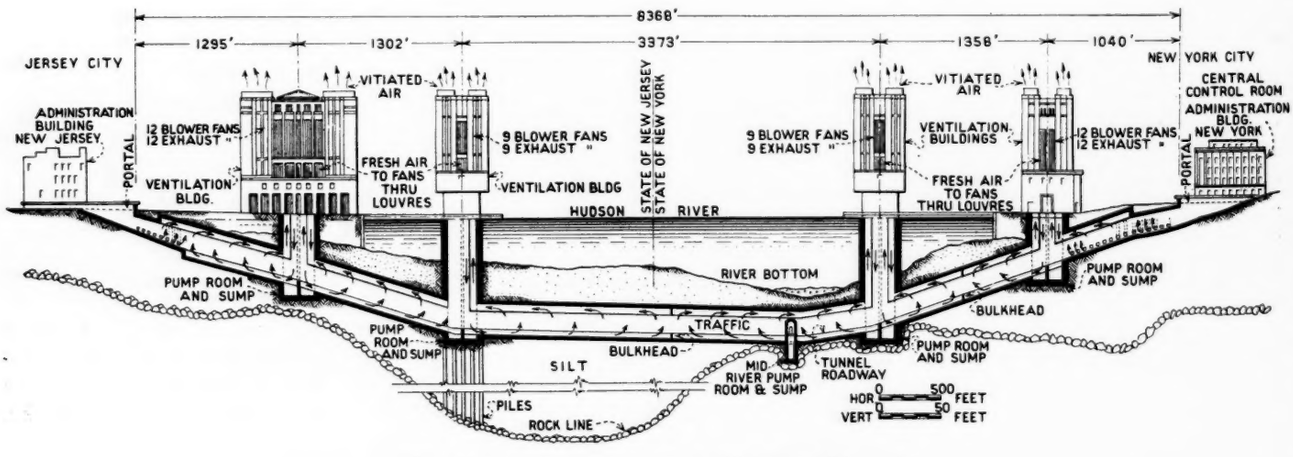



Fig. 1. General arrangement of Holland Tunnel

contact with the exhaust gas from the automobiles and dilutes it. The air then ascends to the ceiling where it enters the exhaust air ports and then goes into the exhaust duct. The exhaust air ports are also adjustable by means of slides so that the air is removed in the proper quantities. The air being supplied to and removed from the driveway at uniform intervals, at the sides and ceiling, prevents smoke from automobile fires moving more than 60 ft. longitudinally.

The fresh air supply to the tunnel is furnished by 42 centrifugal blower fans, and the foul air is removed by 42 centrifugal exhaust fans. These fans are located in the four ventilating buildings shown in Fig. 1. The fresh air fans draw fresh air through the louvers in the buildings and force it down the building air ducts into the tunnel. The exhaust fans draw the foul air from the tunnel and discharge it into the atmosphere through the stacks, as shown in Fig. 1. The foul air being discharged about the roof, prevents any contamination with the fresh air supply.

Fig. 2 is a typical section of one of the ventilating buildings and shows the fans on the various floors, the dampers to each fan, and also shows that three fans are connected to each of the seven fresh air and seven exhaust air ducts of each tunnel. The dampers are motor-operated and are kept closed when fans are not operated.

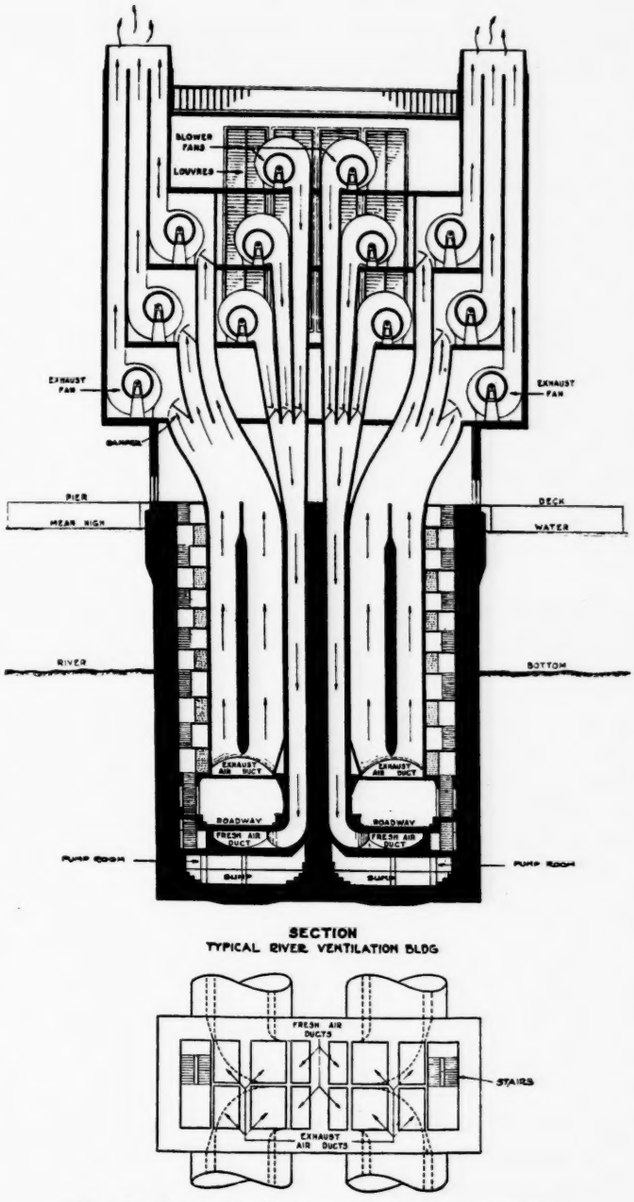



**Fig. 2. Typical section of ventilating building**

The fans are driven by slip ring motors through chain transmission. Each motor has five operating speeds. Each motor can be controlled from a local control, located near the motor, from the control board in the building in which it is located, or from the supervisory control board located in the New York field office.

Fig. 9 shows the local control for an exhaust air fan. The large cabinet contains the contactor panels in the lower portion and the disconnect switch in the upper portion. To the left is shown the motor resistance, and to the right is shown the control box from which the motor can be operated.

The control box and the disconnect switch cannot be operated unless they are unlocked by a key, which is normally inserted in the building control board. When the key is removed from the board, the fan motor in question cannot be operated. When the maintenance men are working on a fan, motor, resistance, etc., the unit is made inoperative by removing the key from the building control board and inserting it into the disconnect switch lock. After unlocking the lock, the disconect switch is opened, thus allowing the men to work in safety.

The local control box contains the speed changing switch and an emergency stop button for fan motor and fan damper.

Each of the four ventilating buildings has a control

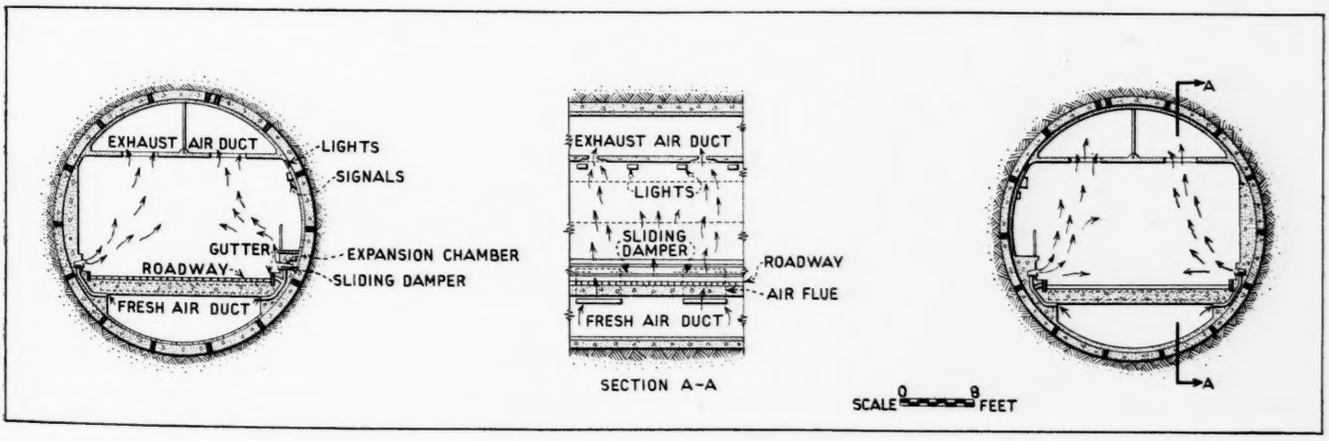



**Fig. 3. Cross-sections of tunnel**

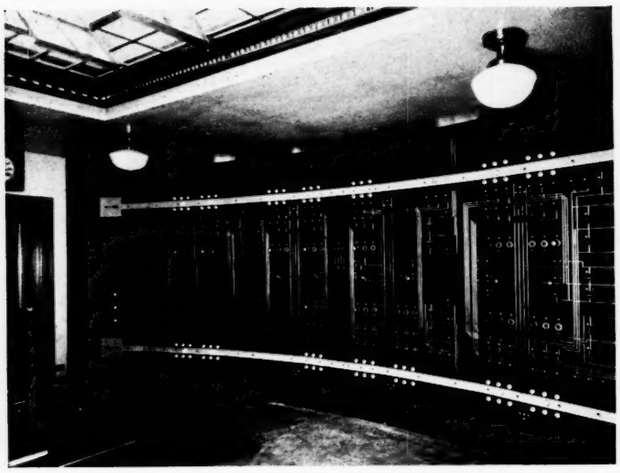


Fig. 4. Supervisory control board for ventilation, lights, etc.

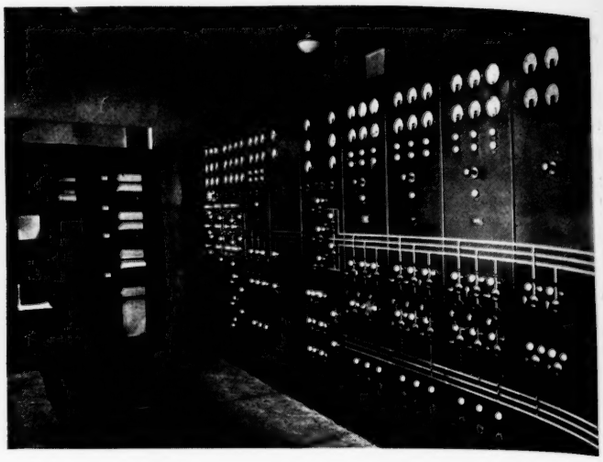


Fig. 5. Control board in ventilating building

board for the operation of the equipment in the building. The boards in the four buildings are not exactly alike, for the reason that there is more equipment in some buildings than in the others.

Fig. 5 shows the control board in the New York land ventilating building. This building has 24 ventilating fans, three transformer cooling fans and nine air cooled transformers. At the extreme left of the board are the switch and temperature testing equipment of the transformers. The bus bar layout is indicated on the board by silver bars for New York current, and copper bars for the New Jersey current.

Lights on the board indicate what equipment is operating, or alive but not operating. The ammeters are for the purpose of indicating how the equipment is operating. The panel at the extreme left of Fig. 5 contains the current measurement apparatus of the local power company.

All equipment in this building may be operated from this board, if necessary. It is normally operated, however, from the supervisory board located in the New York field office.

Fig. 4 shows the supervisory control board from which all ventilating fans, tunnel lights, etc., can be operated. This board is in charge of a supervisor, who sits at the desk, shown in the foreground, facing the board. The supervisory control board is in the main a duplicate of the four control panels in the ventilating buildings, on a smaller scale. At the top of the board will be noted the names of the four ventilating buildings. The white strip near the top of the board, bound-

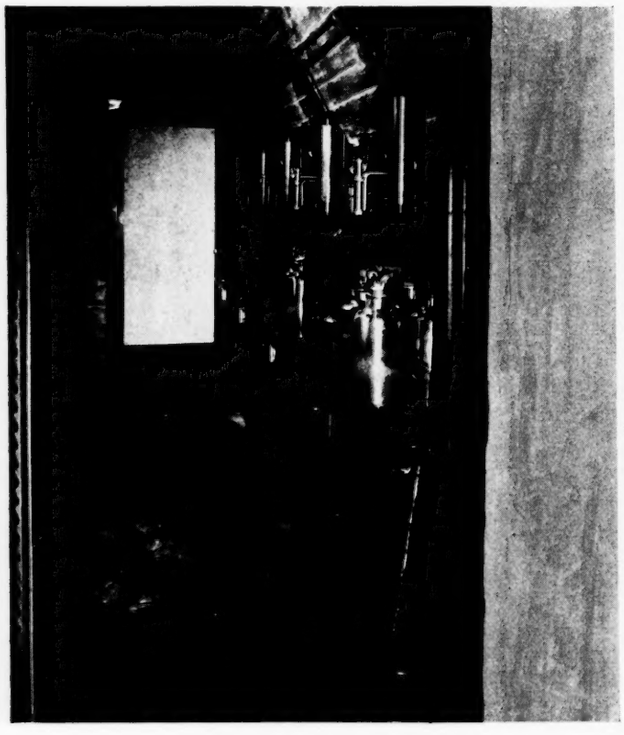


Fig. 6. Battery of CO analyzers

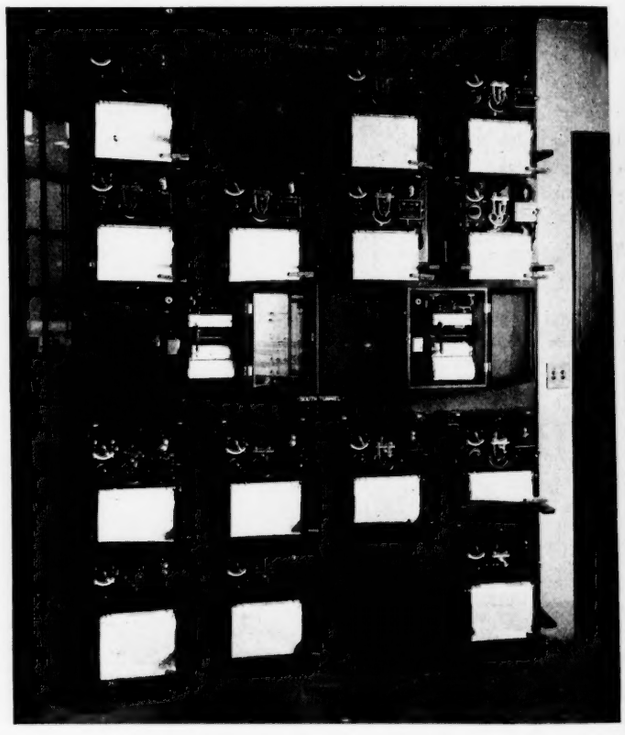


Fig. 7. Potentiometers for indicating and recording CO conditions

ed by black strips, indicates the north or westbound tunnel. A similar strip is noted near the bottom of the board, indicating the south or eastbound tunnel. Between these strips are shown the bus bar layouts with switches and transformers. At the lower left hand corner are shown the three power feeders from the New Jersey power company, and at the upper right hand corner the three power feeders from the New York power company.

The black strip above the white strips indicates the exhaust air duct above the tunnel ceiling, and the black strip below the white strip indicates the fresh air duct under the roadway. In each of the black strips will be noted seven sets of three lights each. These represent the seven duct sections into which the ventilation system of each tunnel is divided. The three lights represent the three fans on each duct section. Below or above these lights are located the switches to operate and control the speeds of the fans.

The black dots (red lights) in the white strips represent the signal controls along the sidewalks of the tunnel. There will also be noted pairs of white spots (white lights) in the white strips. These lights indicate whether the tunnel lighting system is functioning properly.

A small panel is shown between the New Jersey river and New York river panels. In this panel are shown four white lights, three of which indicate which drainage pump is operating in the mid-river sump (lowest point of the tunnel) and the fourth light indicates the safe maximum height of water permissible in the sump.

On each of the four main panels will be found similar lights, some of which indicate the operation of drainage pumps and others the operation of the booster pumps, which automatically supply the high pressure water for fire protection.

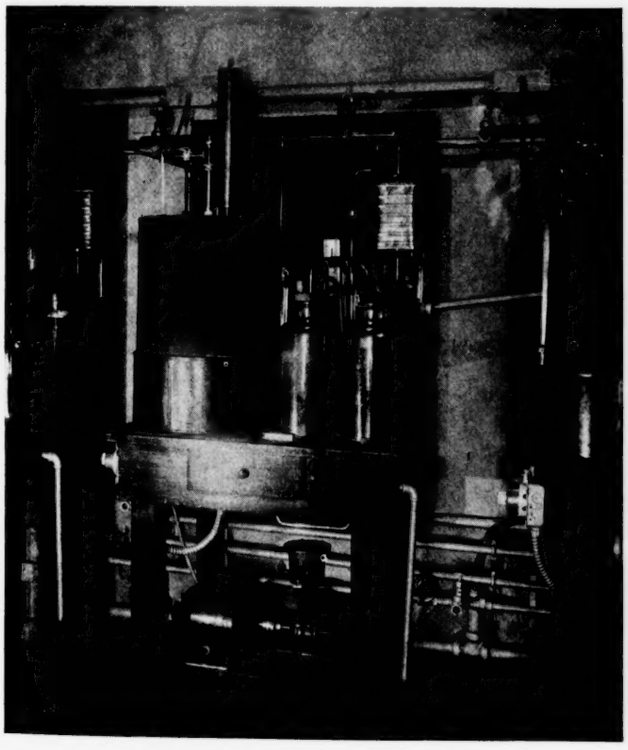


**Fig. 8. Detailed view of analyzer**

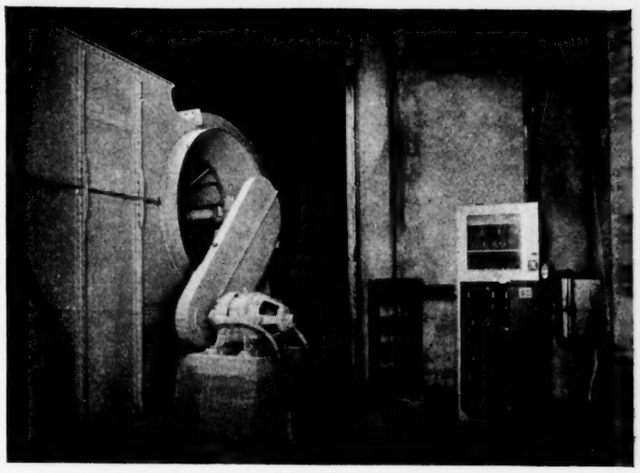


**Fig. 9. Local control for an exhaust fan**

In each of the white strips will be noted seven large white spots (white lights). These are the carbon monoxide indicating lamps which burn dim normally, but when the CO concentration in any section of the tunnel reaches 2½ parts (or more) in 10,000 parts of air, the corresponding light will burn bright and a bell will ring. This calls the supervisor's attention to the condition. He is permitted to watch the light for five minutes before increasing the air supply. The results indicated by the latter lamps are those from chemical analysis made by the carbon monoxide analyzers. There are 14 of these analyzers, four located on the first floor of each land ventilating building, three on the pierdeck floor of each of the river buildings.

Fig. 6 shows a battery of four analyzers in the New Jersey land ventilating building, 7500 ft. from the supervisory control room.

Fig. 8 shows a detailed view of one of the analyzers. The pump draws a sample of air from one exhaust air duct and forces the sample through the apparatus. The air sample passes through an oil and acid catch bottle, then through two bottles of concentrated sulphuric acid and a bottle of glass wool, then through a canister containing filter and absorbent. After this the air is measured and the surplus released. After being measured, the proper quantity of air passes through a container of lump calcium chloride and then into the air coil and cell box, which is inside of the boiler seen in Fig. 8. The boiler is kept at a constant temperature by electrical heating of the water in the boiler.

In the cell box, the air sample comes in contact with a catalyst, known as "Hopcalite", that causes the carbon monoxide to unite chemically with the oxygen present in the air to form carbon dioxide. Heat is liberated by the reaction and warms the thermojunctions which are seen projecting from the top of the boiler. These thermocouples generate electric potentials in proportion to the concentration of carbon monoxide in the samples, and the potentials are recorded by recording potentiometers. The entire apparatus is calibrated against accurately prepared mixtures of carbon monoxide and air. The recording potentiometers are installed on a panel board to the left of the supervisor's desk in the supervisory control room.

Fig. 7 shows the 14 potentiometers. The seven at the

top of the board indicate the CO condition in the north tunnel, and the seven on the lower portion apply to the south tunnel. The other two instruments shown are power recording instruments.

The potentiometers are in operation constantly, 24 hr. per day, every day. The records made are kept on file for future reference. The records are very interesting and from them traffic can be visualized passing through the tunnel. The traffic entering the tunnel proceeds on a downgrade; therefore, the quantity of carbon monoxide produced is small and uniform. The lines produced on the charts are therefore rather regular. When the traffic reaches the level grades it loses its momentum and then it is necessary to step on the gas, which produces more CO than on the downgrades. This fact is shown in the recorders and the lines become a little more irregular than those for the downgrades.

When the traffic reaches the upgrades it is necessary to use more gas and this produces more CO. The upgrade also retards the slow trucks, which in many cases causes them to bunch up, and as a result the upgrade charts show a higher CO and the line is rather choppy.

To the right of the supervisor's desk is the traffic control board. On this board are indicated the signals sent in by the patrolmen in the tunnel requesting fire and wrecking equipment.

To the rear of the supervisor's desk are located the two telephone switchboards, one telephone system is a private system for employees' use only, with no outside connection, and the other is an outside system.

There is also a telautograph system installed. This system consists of five receiving and sending stations and one receiving station. One of the stations is in the supervisors' room, one in each of the two emergency garages, one on each of the two police desks, and one in the superintendent's office. The telautograph system is used for the reporting of happenings in the tunnel, hourly traffic, and important messages.

The supervisors keep a complete log of all happenings under their control. This log shows which fans were operating and for how long at each speed; which feeders were used; power consumption; hourly traffic; maximum and average CO for each hour; weather conditions; time when accidents occurred in the tunnel; what wrecking equipment was sent into the tunnel and when it came out; and explanations for increasing or decreasing the air supply.

The supervisory room is a very busy place at times of heavy traffic, which occur on Sundays and holidays and during the warm weather, as it is necessary to operate economically, and for this reason the power demand must not be increased except for good cause.

The maximum traffic hour to date has been 2500 vehicles, and the maximum daily traffic was 58,702. On the day of maximum traffic, the maximum carbon monoxide was 3.9 parts of CO in 10,000 parts of air. This was caused by congestion due to a fire in the tunnel. This condition lasted a very short time, too short in fact to require increasing the ventilation.

There are nine buildings used in connection with the tunnel, besides 10 double toll booths. Two of these buildings are heated by coal-fired, two-pipe steam systems; three by oil-fired, two-pipe steam systems. Three buildings and the toll booths are heated by electric heaters, and one building is heated by a gas-fired, two-pipe steam system.

## Data on Water Temperatures for Refrigeration

DESIGNERS of air conditioning systems must frequently refer to climatic data of various kinds. While temperature data are easily obtainable, many engineers are in doubt as to the temperatures of water available for condensers, especially if the locality of the installation is a distant one.

The accompanying maps are reproduced from Water-Supply Paper 520, published by the U. S. Geological Survey, Department of the Interior. Fig. 1 shows the probable temperature of well water obtained at depths of from 20 ft. to 60 ft., while Fig. 2 is presented as a basis for estimating the maximum temperature of surface water.

One observer, Van Orstrand, studied 3000 records of temperatures of ground water, and computed that under normal conditions the temperature of ground water obtained at a depth of 30 ft. to 60 ft. will generally exceed by 2° or 3° the mean annual air temperature. In exceptional cases the excess may amount to 5° or 6°. The British Association for the Advancement of Science has adopted as the most probable an increase of 1° F. for every 64 ft. in depth.

For practical purposes it may be assumed that a ground water supply obtained at any depth from 20 ft. to 200 ft. will have a temperature ranging from 3° to 6° above the mean annual air temperature. Fig. 1 shows the probable temperature of ground water at depths of 20 ft. to 60 ft. based on such a relationship.

The relation between surface water temperature and air temperature is much more variable than that between ground water temperature and air temperature. Obviously, the range in temperature of surface water will be considerable, but it is much less than the range in air temperature.

Fig. 2 is a map of the United States Weather Bureau showing normal July temperatures (the probable hottest month). It is quite certain that during July and August the surface water will have a temperature not much below the mean air temperature. On the average, the water will be within 3° above or below the mean monthly temperature in July, and from 2° to 5° above the mean in August.

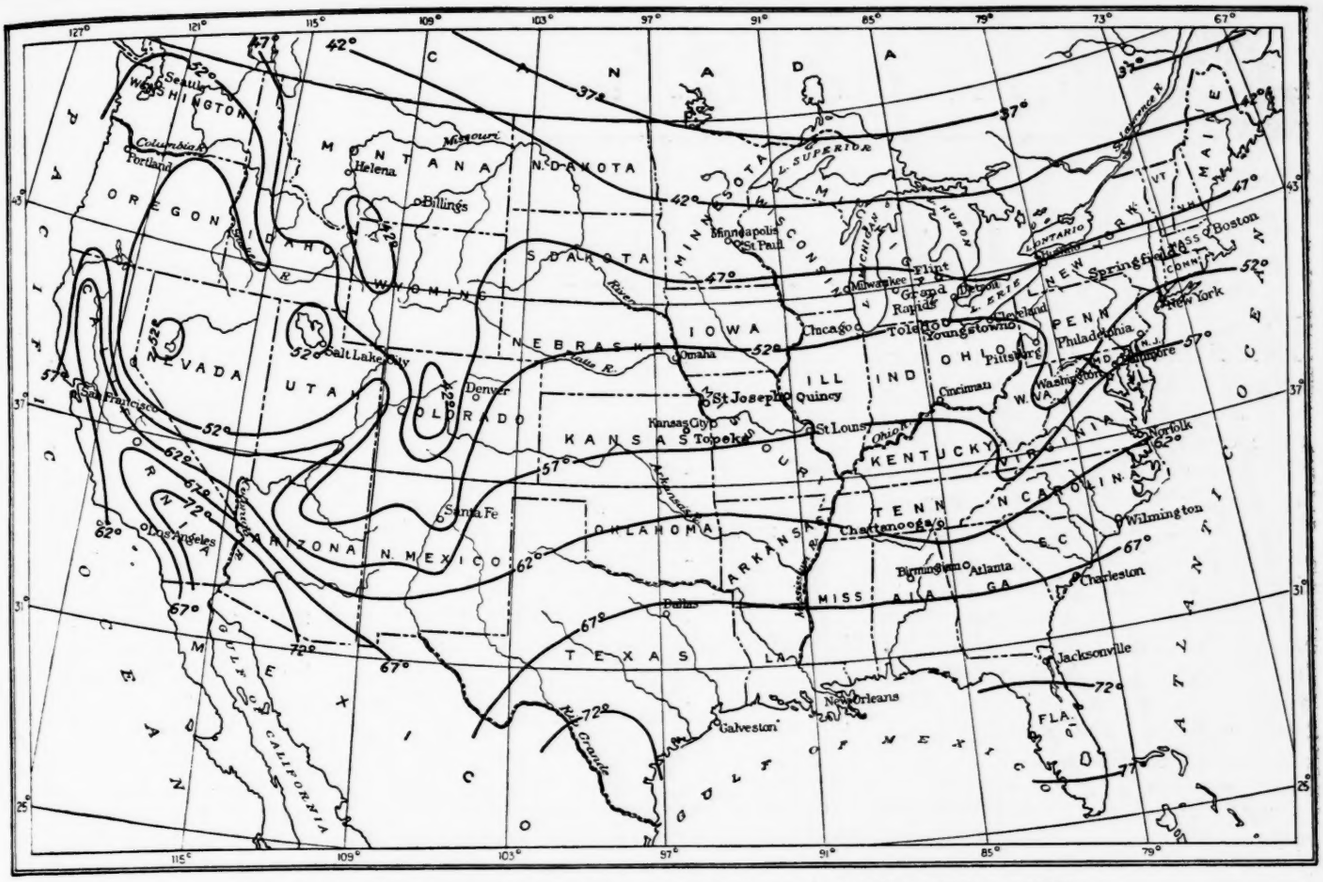



**Fig. 1. Probable temperatures of ground water from depths from 20 ft. to 60 ft.**

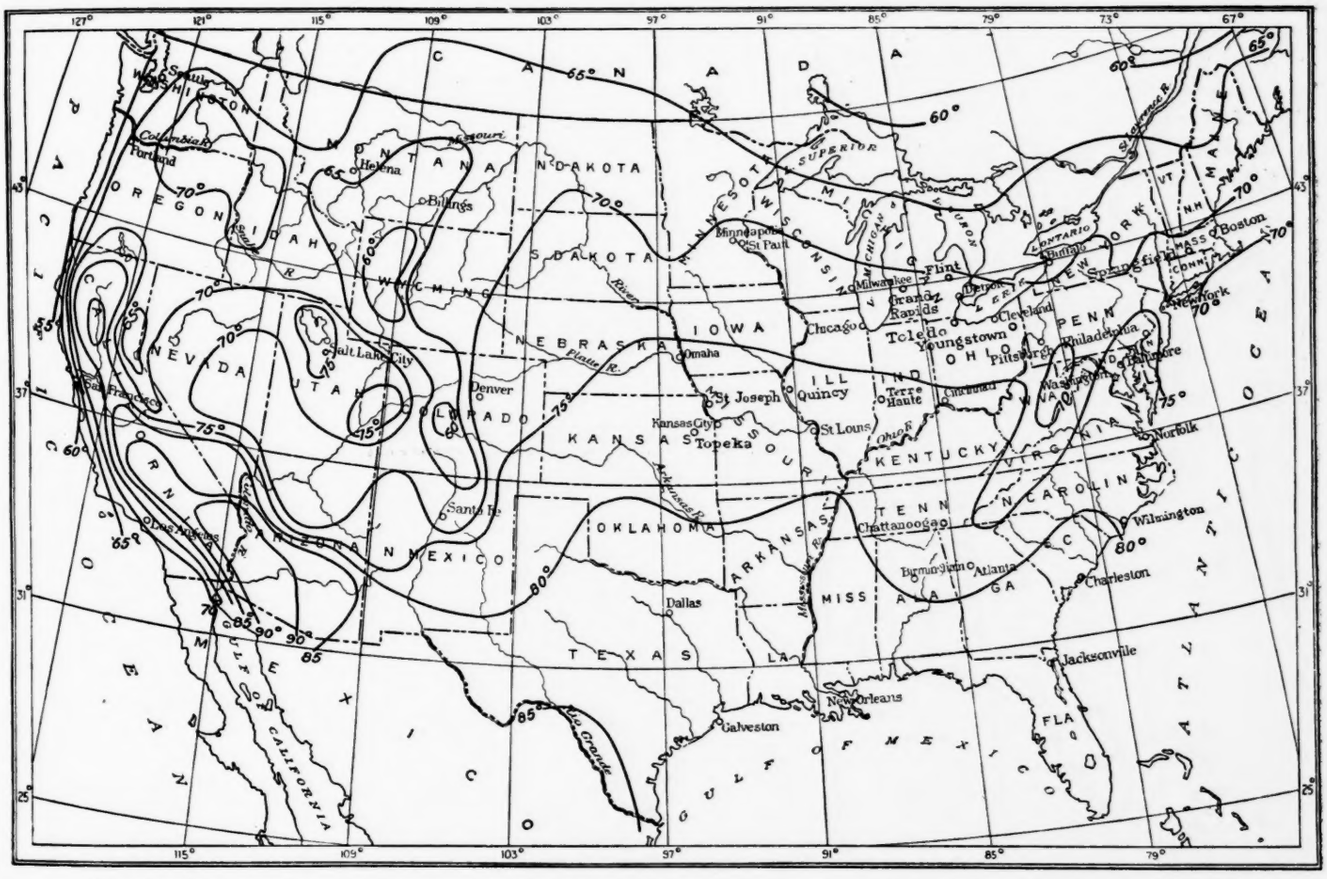



**Fig. 2. Normal temperatures for July. Surface water maximum temperatures will probably be within 3° above or below the figures on this map.**

## WHAT'S NEW IN SMALL BUILDING PRACTICE

# I. The Modern Radiator

RESIDENTIAL buildings to a considerable extent have always used the methods and apparatus which have been available for other types of buildings where these could be adapted. Because of the peculiar requirements of residential buildings, all methods of heating used in other buildings have not been acceptable. On the other hand, for this same reason some methods of heating and apparatus particularly useful for residences have not found acceptance in other buildings.

In the gradually changing practices in residential work which have come about in the past few years none has been more notable than the rapid acceptance of the newer radiator forms. The result has been that the latest practice inclines strongly toward treating the radiator as if it were truly a part of the room itself, and to realize that with the standard forms and designs available pleasing decorative effects can be obtained. No longer need the radiator be either unsightly, overly prominent, strike a discordant note with furnishings, or interfere with the placing of furniture.

The causes which have led up to these changes can be summed up as follows:

First, a definite realization grew up that not only could changes in the traditional forms and designs of radiators be made to advantage economically, but that these designs could result in such greatly improved appearance that they should appeal strongly to the desires of the users. Soon designs appeared which used cast iron as the material but with greatly changed appearance.

Use of materials other than cast iron or steel for heating surfaces received impetus both through price changes in the base metals and through improved ability to handle them to advantage in manufacturing. As a result, the second major change came about. These metals had the property of a high heat conductivity. This property could be made use of by circulating air over the hot metal surface rapidly. A suitable way of setting up such a circulation is to surround the hot surface with a flue or passage for the air. To secure good results it was felt that the flue should completely surround the hot surface. When this was done the surface itself was concealed. Not only was this desirable because of furnishing a passage for air, but in many cases the designs of the hot surfaces did not lend themselves to decorative effects. The covering, however, whether in the form of a grille, box, or recessed enclosure, could be readily covered with harmonious decorative finishes.

Studies made in the past few years on the temperature distribution in rooms when various methods of heating are used have brought out information which has undoubtedly affected the design of radiator surfaces. As the standard apparatus available naturally affects practice, the appearance of this information is the third cause which has brought about the use of the

**A radiator enclosure well designed from the standpoint of both heating and appearance.**

newer radiator forms. Briefly, the result of these studies has been the conclusion that it is desirable to confine the heat emitted to the lower, or inhabited, part of the room. In residence rooms especially this should be accomplished while still preserving the unobtrusiveness and harmony of the heating device with its surroundings.

No sooner was this principle accepted than designs appeared which attempted to accomplish it. These attempts moved along several major lines. Where the hot surfaces are so shaped, or use such a material, that their heat transfer depends largely on air currents, the control and direction of the air flow is the major line of approach. Where a considerable amount of radiant heat is emitted to the room it may become the major control element. Designs soon appeared which combined both radiant and air-carried heat and depended on both these control elements to accomplish their results.

**Because of the number of interesting changes in practice which have taken place in recent years in domestic and small building heating and ventilating, and in view of the many requests received from readers, a complete series of articles will outline current practice in this field. This first article discusses the various types of radiators now in use.**

In radiators of the convector type several possibilities are at once apparent and all have been used. In the first place the surface may be either fully enclosed, partly enclosed, or not enclosed at all. If enclosed, the air outlet may be located either high or low in the room, or even carried by the flue or duct to any desired outlet point. Moreover, the direction of delivery of the heated air may be controlled either inside the flue passage or at the grille face. This makes it evident that great flexibility is possible in arranging the fully enclosed convector type heaters, especially if fan power is used. While some fan-powered units of this character are in use they have not become at all common for residential work.

Partly enclosing heaters of the purely convection type is not a widely-used practice. Partly enclosing the heater and installing the enclosure either recessed in the wall or in the room is done to some extent with radiators which give off a considerable part of their heat by radiation. The degree of enclosure may, and does, vary all the way from almost completely enclosed to the use of only a shelf or offset above the radiator. In cases where the enclosure is slight the principal effects of its use are to add a decorative feature and to permit the horizontal discharge of air. This horizontal discharge is intended to help to keep the heated air in the lower part of the room.

Convection heaters for installation unenclosed are not a common design, especially for residential buildings. One such style is interesting in that it aims to keep the heated air in the lower part of the room by its low height and low location in the room.

Heaters which combine radiation and convection and are of the tube type have met the principle of keeping the heat low in the room by the use of enclosures, either open or recessed, with horizontal discharge, and by so arranging the tube surfaces that a greater part of the heat given off by radiation is directed toward the lower levels of the room.

Among the interesting developments which have come about is the combining of radiant and convective heat surfaces in several ways. Such heaters really combine the enclosed type with a radiant surface. They are able to direct their air discharge horizontally and at the same time to keep directing a considerable amount of radiant heat into the low levels.

The changes which have come about in residential radiators are then: (1) definite attempts to improve appearance and convenience, (2) those due to changed materials and consequent changes in design, (3) those resulting from attempts to keep the heat in low levels.

Most of these basic factors are interrelated to some extent, and enclosing of the radiators, either completely or partly, can be made to help in keeping the heat in the lower part of the room while achieving the objective of good outward appearance. There are some test data which tend to show that these arrangements are also economical in operation. These several points in their favor have brought popularity to the idea of concealing the heaters, and have led to increased emphasis being placed on convection as a means of carrying heat to the rooms. This tendency to use concealed or partly concealed or enclosed heaters with the heat carried largely by convection is one of the most notable changes which have come about in residential heating.

Acceptance and use of these forms have not come about without making necessary the solution of their own peculiar problems. Among these may be mentioned those of dirt and dust on the hot surfaces and in the enclosures; difficulties due to piping and connections in the cramped quarters; problems of securing suitable adaptations of control methods and devices, and the problem of developing suitable, trustworthy, and cheap heating surfaces themselves.

None of these problems can be said to be fully solved, but all are in such state of development that suitable and satisfactory installations are an everyday occurrence. Enclosing of many designs of radiators made of both ferrous and non-ferrous metals has now been done to such an extent that it has been demonstrated that the question of *kind* of material is not a governing factor in the ability of such installations to function.

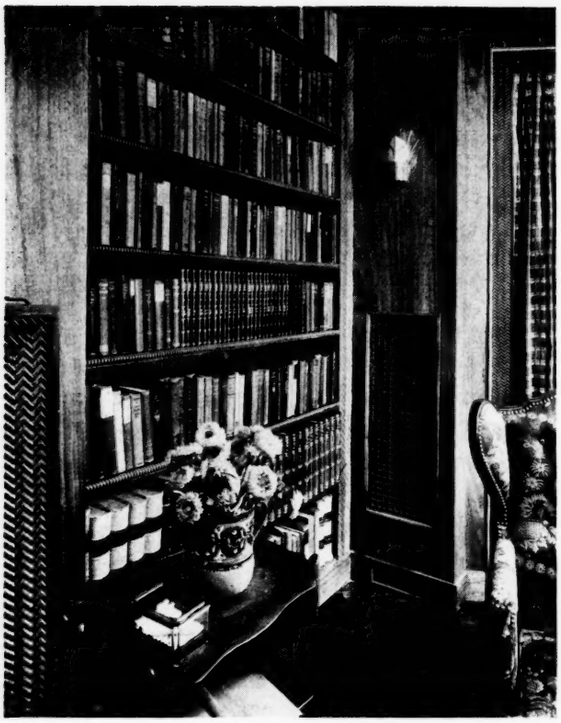
In spite of all the progress made, no general answer to the problem of location is yet at hand. Location under windows is still extensively used. It has the disadvantage that the height of sill limits the height of enclosure whether open or recessed. With horizontal discharge of air the height of the discharge is limited and also air can flow over the hot surfaces only so fast as the draft set up by the short height of enclosure permits. Space for the heated surface and piping is often cramped and limited in all three dimensions by the window height, length and wall thickness.

If heaters are located in other localities and concealed the height of air discharge may be placed at will, more air may be made to flow by gravity over the heated surface, and the hot surfaces may be compressed.

# *Modern Radiators*

THE homely old scrollwork iron radiator has long since been superseded by the slender and graceful tubular unit. Enclosures are obtainable in attractive woods and metals, with lines which blend with the architecture and decorations of the room. Cast radiators, when recessed, are hidden behind delicately curved wrought iron or brass, or, where such treatment is desirable, behind wood grilles.

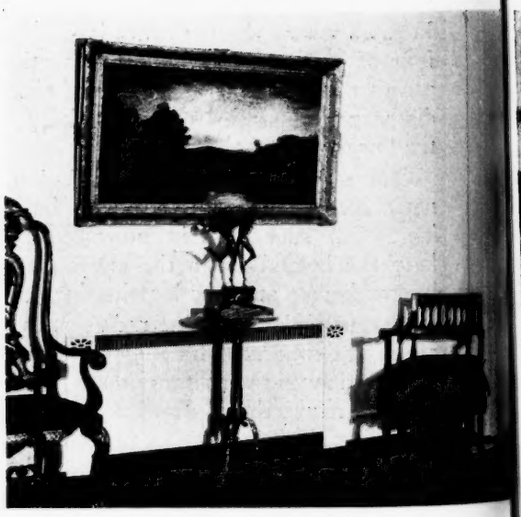
Cabinets with lightweight extended surface, with the advantage of being easily cleaned, are found in



A handsome arrangement of grilles for use with concealed extended surface radiators. Note the inlet grille at the bottom

A cast iron radiator which really radiates. An arrangement of flues in the back also aids the air flow by convection

(Below) Even the grilles of this concealed brass radiator are unobtrusive

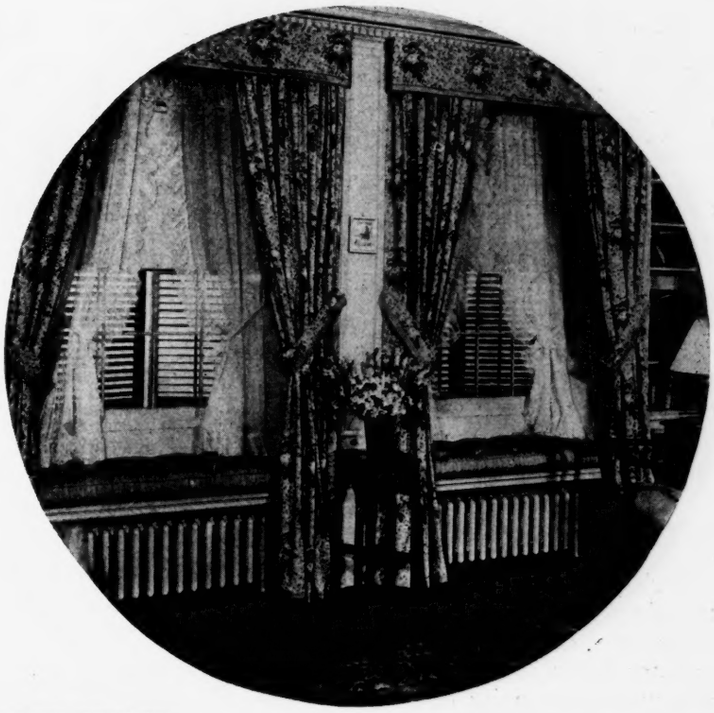


This fully-recessed radiator has copper fins around which the air flows. The front, which radiates heat into the room, is of cast iron

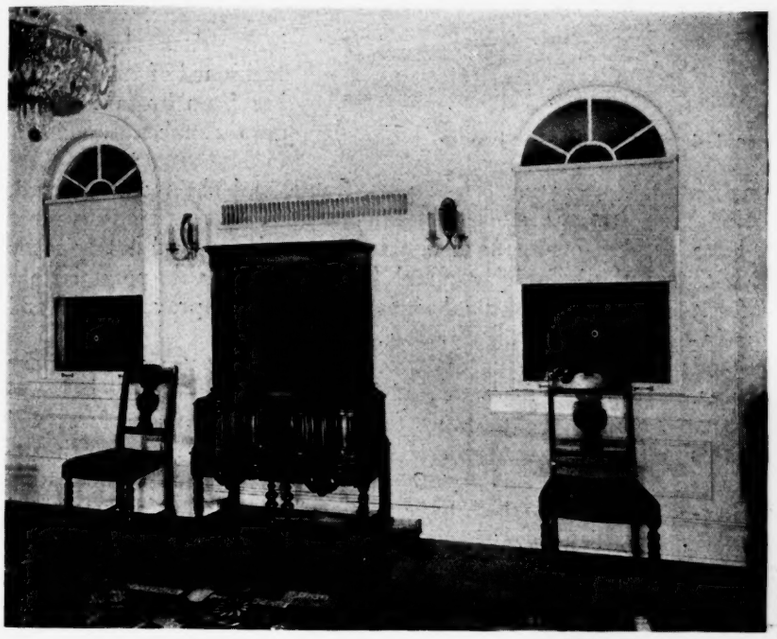
# *and Convectors*

every color of the spectrum. Concealed radiators—really convectors—appeal to every woman, and since they are about as completely invisible as a heating device can be, have become widely popular.

Other types give up their heat by both radiation and convection, some with a smooth front from which come the radiant rays, and with fluted columns in the back to aid convection.



The concealed radiator can be installed between the windows or below them, thus varying the height of the outlet grille. In this room the grilles between the windows fit in nicely with the decorations



The modern tubular cast iron radiator under a window seat. Sufficient space should be allowed under the seat so as not to retard convection

When properly designed, a plain radiator enclosure may not decrease the radiator's output, and is especially desirable with the older and less attractive radiators

Some urge against this location the points that recessing must be used, that insulation must be provided behind the recess, and that the depth dimension of the heaters is sharply limited.

While the use of horizontal air discharge is now much in favor there is no agreement in forms of enclosure, deflector, or other device used to turn the moving air current into the horizontal direction, nor is the form or area of opening of the outlet agreed upon.

Perhaps the most interesting feature of the acceptance of the new radiator forms is the diversity and ingenuity of the shapes and materials used. Interesting material combinations have been worked out. More careful arrangement of surfaces has made it possible to secure heat output with progressively smaller weights of metal and with decreased overall dimensions.

**A small concealed radiator in a bathroom**

Among the interesting types of surfaces which have been brought out is that which combines radiant with convective heating by the use of flat surfaces in front with fluted air passages behind and intended for installation under windows. These heaters are sectional and may be used as direct radiators without enclosures. A form of this general type is particularly interesting because it uses a combination of metals. When this type is installed enclosed the hot flat surfaces form the front of the enclosure and may be decorated to harmonize.

Among the styles of heaters designed specifically as convectors the fin is the favorite heat conveying device. Its merit lies in the ability to obtain intimate contact with air by extending into the air stream or by causing the air stream to break up by impinging it against the fins. The use of finned heaters is not at all new but the improved methods of application in the past few years have given them wide popularity. They have been made and used thick and thin, long and short, close spaced and wide spaced, fastened to the primary heat surface by practically all known methods of fastening, including casting, soldering, welding, brazing, and crimping. They have been fashioned of metals varying from brass and copper through steel and aluminum to cast iron. They appear as spirals, pins, flutes, and sheets; are curved, straight, and streamlined at will. Their variety is great but ingenious designers seem to have tried nearly every thinkable shape and form. The notable point is that so many of the designs resulting have proved useful and commercially feasible.

Rumors persist that we are soon to use revolutionary heating methods and heating surfaces—that baseboard heaters, wall-hung fabrics and reflecting surfaces will soon be with us. If so they will have to be of such outstanding excellence as to overshadow these heating surfaces which have appeared in the past few years and which have themselves produced no small revolution in heating practices.

# II. Modernizing a Gas-Fired Warm-Air Plant

By J. DONALD KROEKER†

A GAS-BURNING winter air conditioning installation made last fall in a large residence in Warren, Pa., is not only a good example of present practice but changes made in the course of its installation well illustrate many of the changes in practice which have come about during the past 30 years.

When, nearly 30 years ago, two central gas-fired heaters with gravity circulation were installed, they represented what was then considered the last word in proper heating. As was then the common practice when warm air was used for the heating medium, they were arranged to take their air supply from the outside, and large circular ducts were used to distribute the heated air to the rooms. This old installation was manually

†Heating Engineer, Pennsylvania Furnace & Iron Co., Warren, Pa.

controlled, and contained no provision for adding moisture to the air. Neither was there provision for filtering.

As might be expected in view of the condition of affairs 30 years ago, the installation did not operate to the satisfaction of the owner. For one thing, he found it necessary to add two small floor furnaces, one in the living room and another in the vestibule. These were of small capacity and were intended to be operated only in case of necessity. In spite of these additions, operation with its manual control resulted in overheating and underheating, and several rooms, notably the living room and library, were never satisfactorily heated, even in only moderately cold weather. Creaky floors and dry furniture were experienced. To protect the beautiful rugs, fine tapestries and upholstry from dust and dirt, attempts were made to filter the air at the registers, using cheese cloth. The result was a decrease in furnace capacity and effectiveness.

**In this, the second of the series of articles on small building practice, the author explains how an obsolete warm-air system was replaced by an up-to-date domestic air conditioning plant.**

## Modern Rectangular Ducts Installed

The installation which replaced this old one includes the modern features of recirculation without connection to outside air, automatic control, use of filters, positive circulation by fan, humidification apparatus, and rectangular ducts instead of the circular ones formerly used. These several features are coming into such common use that they may be said to represent the difference in practices which have come about in recent years.

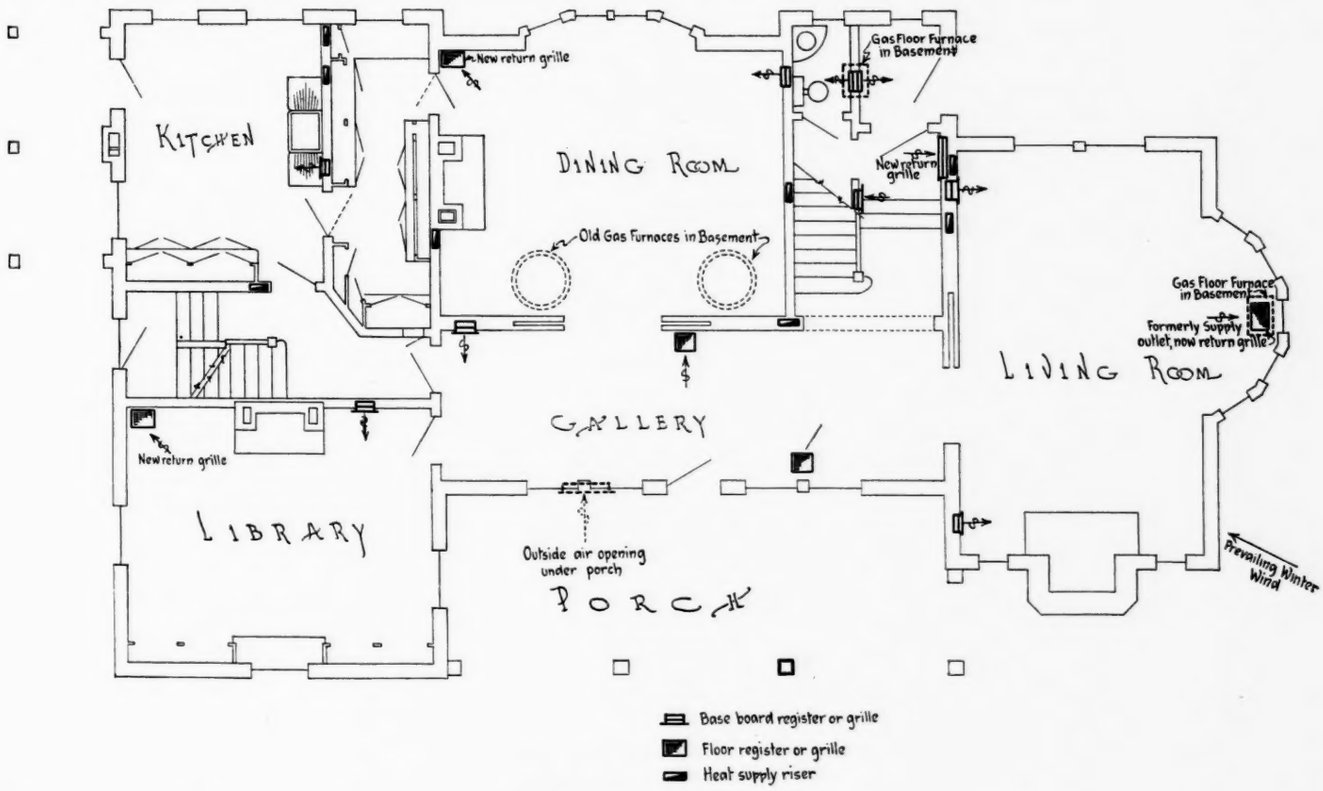
In this case, because of the difficulty of rearranging openings for supply and return air circulation, it was considered desirable to use the old openings as far as practicable. As a result, new metal ductwork was connected to existing openings in may cases.

The new installation uses one central furnace to replace the several units required in the old installation, and makes use of natural gas as a fuel.

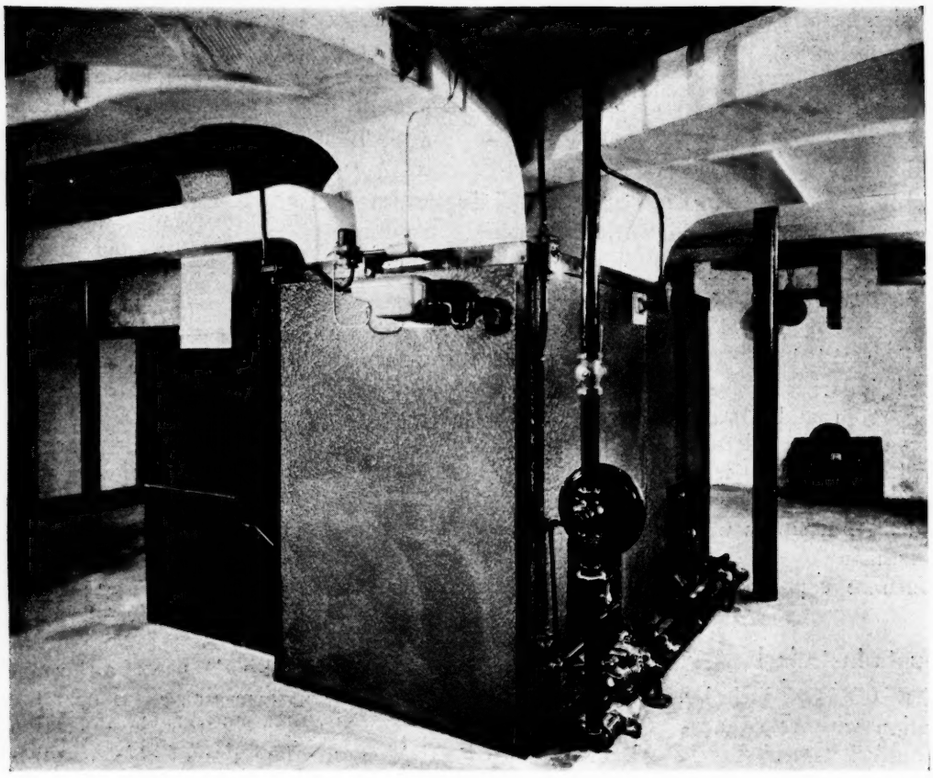
Automatic features include steel heating elements, so arranged that heat liberated at the burners quickly finds its way to the air, and as the burners are under the control of a room thermostat located in the stair hall of the first floor, the system responds quickly to the demands of the thermostat. An arrangement was also included which may be called a "by-pass burner," which is not under thermostatic control, and which maintains a constant liberation of heat as a means of overcoming the "cold 70" so often discussed in connection with the quick-responding fuels.

Another feature of the control is the use of a thermostatic element located in the warm-air stream near the outlet to the furnace, and which controls the operation of the centrifugal blowers. The use of this arrangement prevents starting of the blower until the air temperature at the outlet to the furnace is high enough so that cold air will not be supplied to the ducts. This eliminates the possibility of unpleasant cold drafts being experienced in the rooms.

Oil-coated filters are installed in the return air con-




**First floor plan of the system**



View of gas-fired furnace showing rectangular ducts. The washer is at the rear.

nection just ahead of the blowers, and effect the elimination of dust particles, preventing the circulation of the dust through the duct system.

The moistening arrangement consists of the use of evaporating pans placed above the heating elements. Water is supplied to these fans under the control of a humidistat placed inconspicuously in the dining room.

In accordance with the latest ideas that it is advisable to keep air delivery temperatures low, the heat distribution outlets were sized on the basis of providing air at 130° delivery temperature in sufficient volume to take care of the calculated heat losses.

## Drafts Given Consideration

Careful consideration was given to the matter of eliminating drafts. As a result of this study, return connections were installed in all of the larger rooms on the first floor. Because of the owner's wish that the return openings be inconspicuous, it was not possible to place the return openings in ideal positions, except in the case of the living room. In this case, it was possible to locate the return opening under the windows by making use of the space occupied by a warm-air supply opening used in the old installation. It was not possible to bring the return ducts from the second floor, and a return opening was used in the stair hall to recirculate air returning from the second floor rooms.

One warm-air outlet was added in the living room to satisfy the heat requirements there without creating excessive velocities in the outlet previously installed.

The necessity of using existing supply and return openings to as great an extent as possible made it impossible to maintain ideal register velocities, or to supply air at the most desirable locations.

## Trunk Lines Instead of Individual Leaders

Instead of using the practice of individual round pipe leading from the furnace to each room, use of the fan made it possible to use trunk lines to a considerable extent. Two main trunk lines were run from the furnace and only a few individual ducts to nearby outlets were necessary. In the old installation, headroom in the basement had been cut to 5 ft. at many points, while the use of rectangular ducts with main trunks made it possible to keep a headroom clearance of at least 6 ft. 5 in., except at one point where it was necessary to run a duct under a beam.

Duct sizes were calculated on the basis of a velocity of 400 ft. per min. in the most remote sections. Large throat radii were provided in the supply ducts to reduce total resistance to a minimum. All supply ducts were insulated with ¼ in. aircell asbestos, covered with 10 lb. asbestos paper. To complete the appearance of the entire basement the joists were sealed with ½ in. insulating boards.

After a full season of operation which has included some sub-zero as well as some abnormally windy near-zero weather, the plant has functioned to the satisfaction of the owner, and in doing so illustrates not only a good modern installation, and the changes in practice which have come about, but also that such an installation can be made to work, even when some structural difficulties are imposed in the case of an old building.

# District Heating Moves Ahead

**Even during an off year much construction work has been done. Here are the chief construction projects briefly summarized.**

THE past year or two have not been considered good times in which to embark upon new projects or even to extend existing facilities. Nevertheless, during the past twelve months a number of utility district heating projects have extended their lines while at least one extensive new project has been started. Other plans which would undoubtedly go ahead otherwise are known to be held up because the time is considered unsuitable. Institutions have done a sizable amount of construction also but industrial lines have reflected the prevalent feeling of hesitation to a marked degree.

In the utility field the beginning of the Duluth Steam Corporation project has been outstanding; not because of size especially, but because of the financing method involved. Extensions of lines in New York have involved 30,000 lin. ft. of line. In several cases high-pressure steam service to industrial users has been undertaken while at least two by-product units have been placed in operation.

While the following summary is by no means complete, it is believed to include the most interesting and unusual projects of the past year.

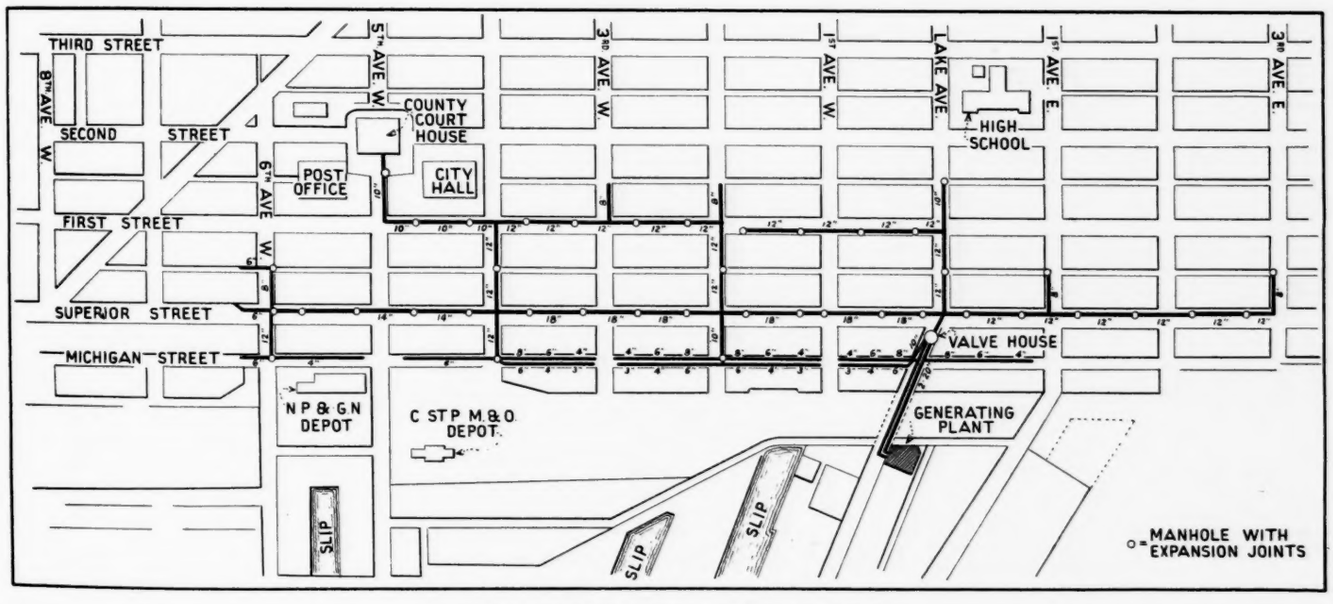
## Duluth Steam Corporation

A district heating system for Duluth has long been talked about, and plans were made in 1929 for the construction of such a project. Following the market crash, however, the plans were held up, and it was not until this past winter that the idea was revived, this time by the Chicago investment house of Haskell, Scott & Byrne. The plan for financing the new company was rather unusual, since it called for the sale of over $1,500,000 worth of one-year 6% notes to the companies who do the construction work and supply the equipment. At the end of the year it is hoped that it will be possible to sell a bond issue to the public, especially since it will be easier to raise money on a completed plant than on a paper project.

In the generating station will be installed four 851-hp. four-drum watertube boilers with water walls and air preheaters. These boilers will be fired by unit pulverizers, each of 9000 lb. capacity, under three of the boilers, and two units of 4500 lb. capacity each under one boiler to care for off-peak loads. The water of Lake Superior is favorable to boiler operation and no treatment is required except deaerating heaters.

The boilers are designed to operate at 425 lb. pressure and 300% rating, giving a maximum output of approximately 360,000 lb. of steam per hour. However, the operating pressure will be about 230 lb., carrying this pressure in the feeder to the distribution system where it will be reduced to meet the requirements of the load on the different mains.

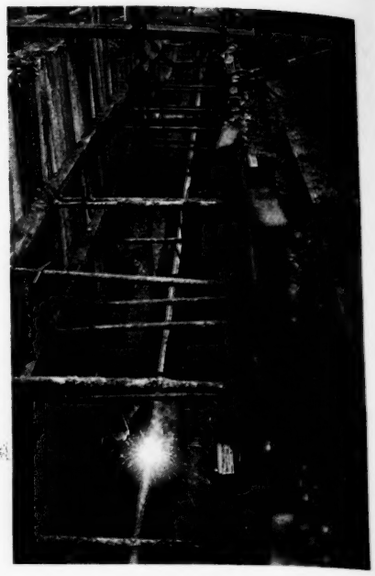
The district to be served is the main business district in the city of Duluth, and is approximately ten blocks long and three blocks wide. There are some adjacent areas that will probably be served, consisting of wholesale establishments and industrial plants. The first installation will consist of approximately 16,000 ft. of mains and 10,000 ft. of service connections, the mains varying in size from 18 in. to 8 in. These mains will




**Layout of district heating system in Duluth**

# *Distribution Lines Under Construction*

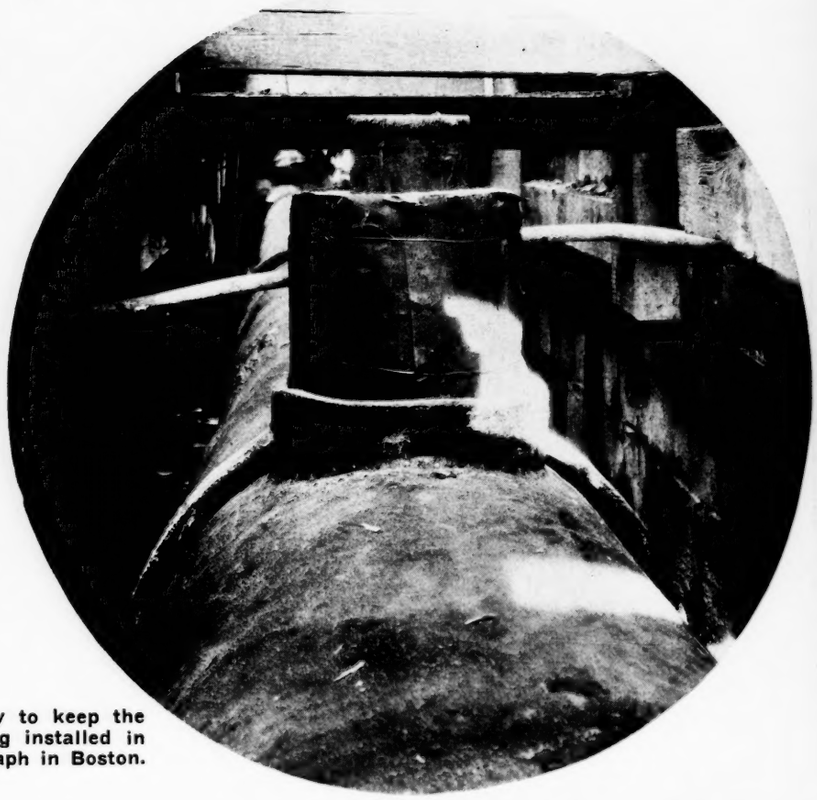
***District heating utilities continue to extend their lines. These views are typical of the work done during the past year.***



A view from Indianapolis. With the pipe in place the welder is making the joints.

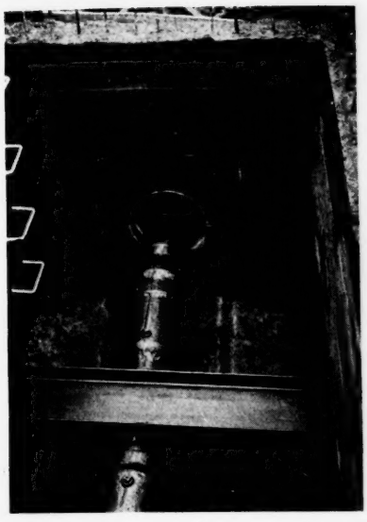
(Left) A 10-in. line of the Connecticut Light and Power Company being installed in a shallow trench. Note the close work necessary in order to avoid the other line which can be seen at the right

(Below) Three lines in split tile conduit all in the same trench. The Washington (D. C.) Gas Light Company lines in place ready for refilling.

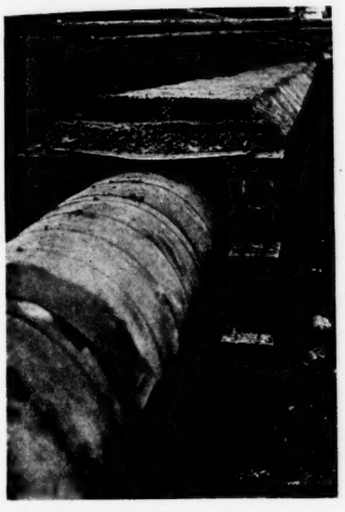


(Right) Heavy shoring was necessary to keep the trench clear while the line was being installed in cast iron conduit. A progress photograph in Boston.

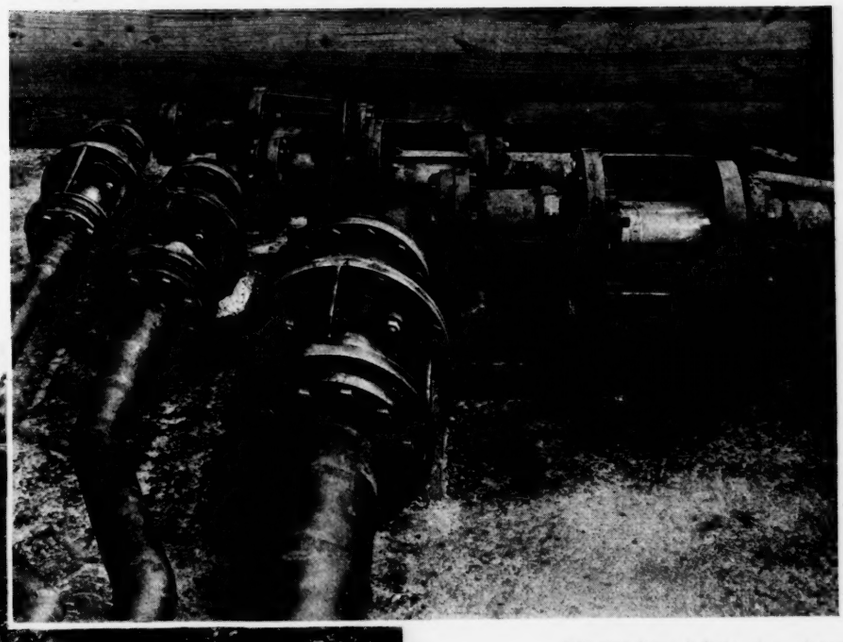
(Right) An anchorage point and expansion joints in a concrete manhole in one of the lines of the Indianapolis Power and Light Company.



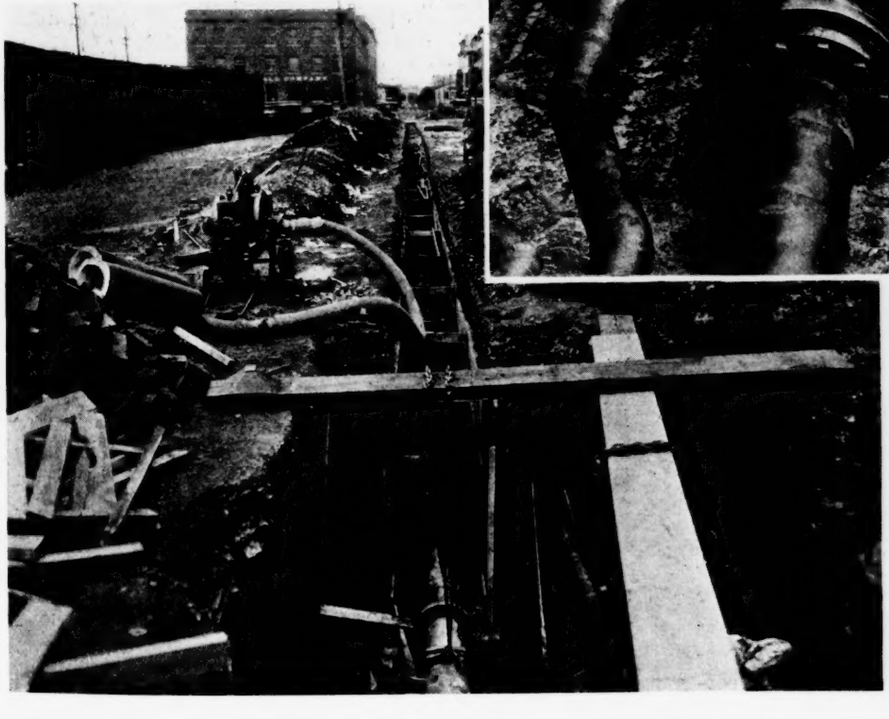
(Right) The pipe goes into the trench. The New York Steam Corporation finds it necessary to do much of its construction work at night.



The covering is on and the cellular tile conduit is being laid on the concrete foundation.



Expansion joints in place in a system serving an educational institution.



(Left) Pipe in place and connections being made at a manhole in a line under construction for the York (Pa.) Steam Heating Company.

be laid in concrete box-type conduits. The pipe will be extra-strong black steel welded throughout and all fittings and expansion joints will be of the 250-lb. class. The mains will be covered with double standard thickness, 85% magnesia applied by the broken joint method, cemented on and wrapped with waterproof paper and painted with waterproof paint. This plant anticipates serving about one half of the available 1,500,000 sq. ft. of radiation in the district during the first year.

The power plant building has progressed to a point where structural steel is now being erected. The first boilers came out of the shop May 20, and were due to arrive in Duluth about June 1. Underground construction work has been started and it is anticipated that service to consumers will begin before September 15. The contracts are so dated.

The site and building will cost $200,000, the mechanical equipment $900,000, and the underground $500,000, a total of $1,600,000 for the plant and system.

Officers of the Duluth Steam Corporation, located in the Sellwood Building, Duluth, Minn., are as follows: A. W. Strong, president; D. S. Holmes, vice-president and treasurer; J. J. Dwyer, vice-president; R. L. Mayall, secretary; A. P. McDonald, general manager.

Among those firms associated in the construction of the new system are the Pillsbury Engineering Company, engineering; M. J. O'Neil, contractors for underground work; Dohn Building Company, buildings; Edge Moor Iron Company, boilers and power plant equipment.

## Dayton Power & Light Company

During the early part of last year the Dayton Power & Light Company completed its Longworth Street Station, which has a capacity of 150,000 lb. of steam per hour, with a single Stirling boiler. This unit, which represents the initial installation, has a water-cooled bridge wall. A tubular type air preheater raises the temperature of the air to 390° F. The furnace is equipped with an underfeed stoker having 11 retorts and 41 tuyeres.

Feed water is drawn from two wells, having cast concrete sectional casings, and pumped into a 100,000 gal. storage tank overhead. It is drawn from the tank as needed, and treated in tray type heaters, used in connection with the lime-and-soda hot-process. These heaters are fitted with vent condensers, and are mounted on the sedimentation tank.

A 2700-ft. 16-in. line conveys the steam to the distributing system. At the point of junction a pressure-reducing valve steps the pressure down to 90 lb. for the intermediate pressure system. Steam for the low-pressure system is bled from this point through a motor-operated valve, controlled from the steam plant. The line is welded throughout, and is fitted with corrugated copper expansion joints.

## York Steam Heating Company

The York Steam Heating Co., York, Pa., has completed a 2300-ft. line from its generating station to the passenger station of the Pennsylvania Railroad Company. The line is built of 8-in. steel pipe with all welded joints, and will supply steam at about 100 lb. pressure. The railroad will use the heat for car storage, freight warehouses, and offices and station buildings. The load amounts to approximately 7500 sq. ft. of radiation, with a consumption of about 10,000,000 lb. of steam per season. The line is insulated with sheet asbestos enclosed in a concrete duct with underdrainage using hollow tile embedded in loose stone.

At the present time the company is preparing to serve the plant of the Keystone Color and Paint Company with high-pressure steam for process work and heating. This line will be of the same type construction as the Pennsylvania Railroad line, excepting that 4-in. pipe will be used for a total distance of 341 ft.

## Other Additions

Other expansions of service during the past year included over 30,000 ft. of distribution piping, ranging from 3 in. to 24 in. diameter, by the New York Steam Corporation.

The Iowa-Nebraska Light & Power Company opened its K Street Station, in Lincoln, Neb., a 12,000-kw. plant in which steam is bled from the turbo-generators for district heating. The plant is designed for a future average heating load of 31,700 lb. of steam per hour.

The Iowa Railway and Light Corporation completed work on the by-product turbine in Cedar Rapids. This machine is a 7500-kw. unit, non-condensing, which exhausts into the central heating mains at a pressure from 5 lb. to 20 lb., depending on the weather. A bleeder device extracts steam at 100 lb. pressure to supply a high-pressure steam main. The same company placed in service, in Marion, Iowa, a 5000-kw. turbine exhausting into the central heating mains at 3 lb. to 10 lb. pressure. At Grundy Center, Iowa, the Northeastern Light & Power Company placed in operation a new central heating station with a 500-kw. turbine which exhausts into central heating mains at 2 lb. to 10 lb. pressure.

The Indianapolis Power & Light Company completed this year a one-mile high-pressure line 16 in. and 10 in. in diameter, 250 lb. pressure, supplying at the terminal steam at 175 lb. pressure and 100° superheat.

The Scranton (Pa.) Electric Company increased 575 ft. of 5-in. mains to 8 in.; 575 ft. from 6 in. to 10 in.; 987 ft. of 6 in. to 12 in., and renewed 870 ft. of 8 in. main.

Edison Electric Illuminating Company of Boston extended its system by adding 4100 ft. of line ranging from 6 in. to 16 in. diameter, the figures being for the year ended May 1.

Union Electric Light & Power Co., St. Louis, added a second large feeder main. Other utilities which added to their lines include the Washington Gas Light Co., Washington, D. C.; Connecticut Light & Power Co., Bristol, Conn.; Windber Heating Co., Windber, Pa.; Western Public Service Co., Sidney, Neb.; Milwaukee Electric Railway & Light Co., Milwaukee, Wis.; Iowa Southern Utilities Co., Grinnell, Iowa; Pittsfield Electric Co., Pittsfield, Mass.

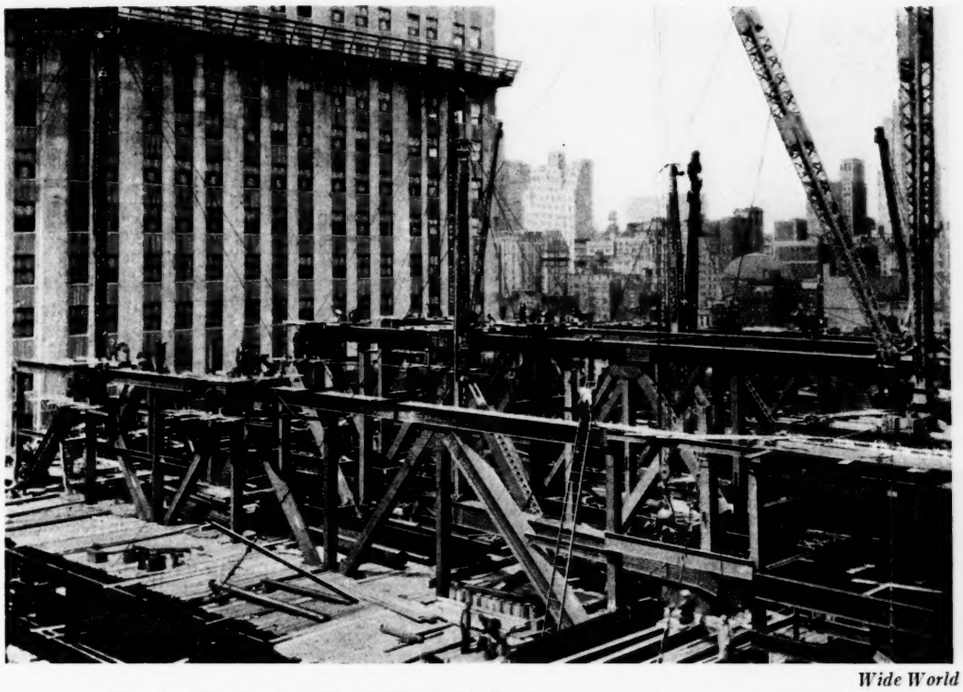
In addition to the work done by the utilities, installations or additions were made by a large number of institutions, including 37 colleges and schools, 11 hospitals, and seven other government and institutional jobs.

# Rockefeller Center

## III

# Air Conditioning the Music Hall

By ANDRE MERLE†



*Wide World*

**Fig. 1. The International Music Hall, showing progress as of April 27.**

### Introduction

ONE can not describe the air conditioning system being installed in the International Music Hall without paying tribute to the vision, courage and faith which the owners and lessees have shown in their support of the whole Rockefeller Center project. The fact that they have such faith in the future and the courage to proceed with this immense project means much to the country at large, and possibly means even more to the thousands of men who are employed in the construction of the buildings which will comprise Rockefeller Center.

To the consulting engineer, Clyde R. Place, who is in charge of the design of mechanical and electrical equipment, fell the responsibility of planning the various air conditioning systems for the different buildings. Rockefeller Center will have the greatest amount of air conditioning of any building project ever built, the cost of this work alone being $4,000,000. The plans for the whole project call for approximately 10,000 tons of mechanical refrigeration with 4,000,000 cu. ft. of conditioned air circulated per minute. Approximately 15,000 tons of air ducts will distribute cooled and filtered air for 130,000 people.

It will be recalled by those who read the first installment of this series[1] that the International Music Hall is designed to stage exhibits and revues on a large scale, and that it can be converted, if desired, for use as a sound motion picture or legitimate theater. It will cover a ground area of over 60,000 sq. ft., and will have a stage 143 ft. wide and 62 ft. deep.

The air conditioning system installed in the Music Hall (Theater 10) represents the latest practice. The architectural and building construction called for special designs for most of the supply outlets, and great care had to be taken in the routing of ductwork of which approximately 40 tons were used in the main ceiling alone. The air is supplied through a downward system, entering the spaces to be conditioned through ceiling outlets and exhausted through floor or side wall registers.

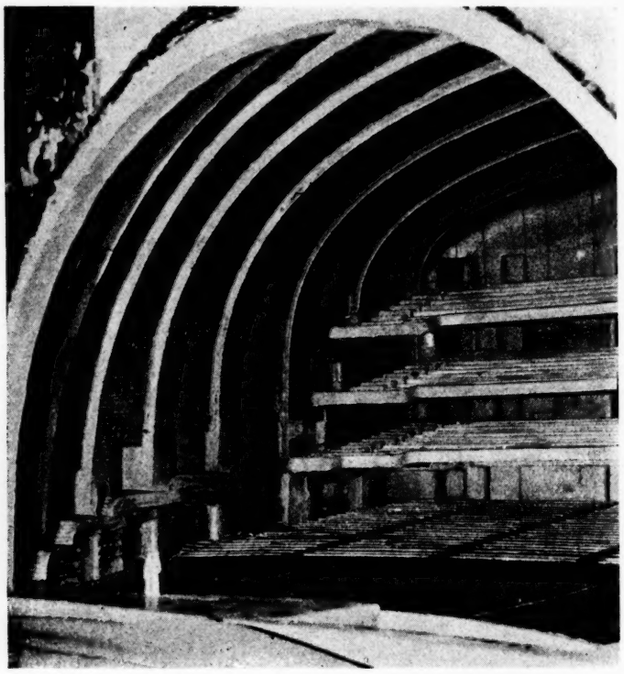
The air conditioning apparatus includes that for refrigerating, washing, filtering and dehumidifying. In winter the air can be humidified and tempered. Radiion is applied to remove objectionable odors.

### Heat Load

The heat gain is especially large in the International Music Hall and adds considerably to the required capacity of the refrigerating machinery. The lighting

†Of the office of Clyde R. Place, Consulting Engineers, New York.

[1]Rockefeller Center—1, HEATING AND VENTILATING, May, 1932, page 19.



*Walter H. Kilham, Jr.*

**Fig. 2. Architect's model—interior of Music Hall**

of the theater calls for approximately 285,000 watts, distributed as shown in Table 1. Another factor which increased the gain was the location of the theater, with two sides exposed. The Fiftieth Street side has a southerly exposure from which a large heat gain will result in the afternoon. During the overture—15 min.—the lighting load will not exceed 285 kw., and during the stage show the maximum load will be 210 kw.

## Performance Guarantee

The guarantees call for 77° dry bulb temperature and 55% relative humidity to be maintained during the summer, spring and fall. A 70° dry bulb and 45%-50% relative humidity are called for in the winter. Allowable variations from the specified conditions are plus or minus 2° temperature and plus or minus 4% relative humidity. Outdoor conditions for which the systems were designed are 95° dry bulb and 75° wet bulb in the summer and 0° in the winter.

The temperature difference between the entering air and the room temperature should not exceed 16°, which is the maximum permitted in this office. The following table outlines good practice for the temperature difference between the entering air and the room temperature:

| Height of Room, Feet | Temperature Difference |
|---|---|
| 10 | 10° |
| 15 | 12° |
| 25 | 14° |
| 30 | 16° |

The mezzanines have been designed and balanced so as to have a slight excess of exhaust air over that supplied. This feature prevents spilling of air over the mezzanine rail on to the occupants directly below.

TABLE 1
ELECTRICAL LOAD

| Location | Connected, Kw. | Maximum Demand, Kw. |
|---|---|---|
| Stage footlights | 42 | 20 |
| Valance border | 70 | 30 |
| Cove | 240 | 90 |
| Chordal runway | 32 | 16 |
| First mezzanine soffit | 30 | 15 |
| Second mezzanine soffit | 28 | 14 |
| Third mezzanine soffit | 25 | 12.5 |
| Main ceiling arc spot light cove D | 90 | 60 |
| Musicians' flood lights cove C | 48 | 48 |
| Main ceiling perforations | 72 | 18 |
| Grand foyer — 5 watts per sq. ft. | | 100% |
| Lobbies — 3 watts per sq. ft. | | 100% |
| Mezzanine promenade — 1 watt per sq. ft. | | 100% |
| Lounge — 2 watts per sq. ft. | | 100% |

## The Three Air Conditioning Systems

In order properly to maintain the conditions as outlined, and due to the immense size of this theater, the systems were divided so that sections calling for large variations in entering air temperatures would be served by separate and independent systems. For simplicity, these systems or units are termed A, B, and C. Table 2 clearly indicates the sections served, air quantities, etc., and the schematic diagrams, Figs. 3, 5, and 6, indicate the position of the supply and exhaust air outlets. This zoning arrangement will result in economy of operation.

The three systems are designed so as to produce comfortable conditions during intermediate seasons

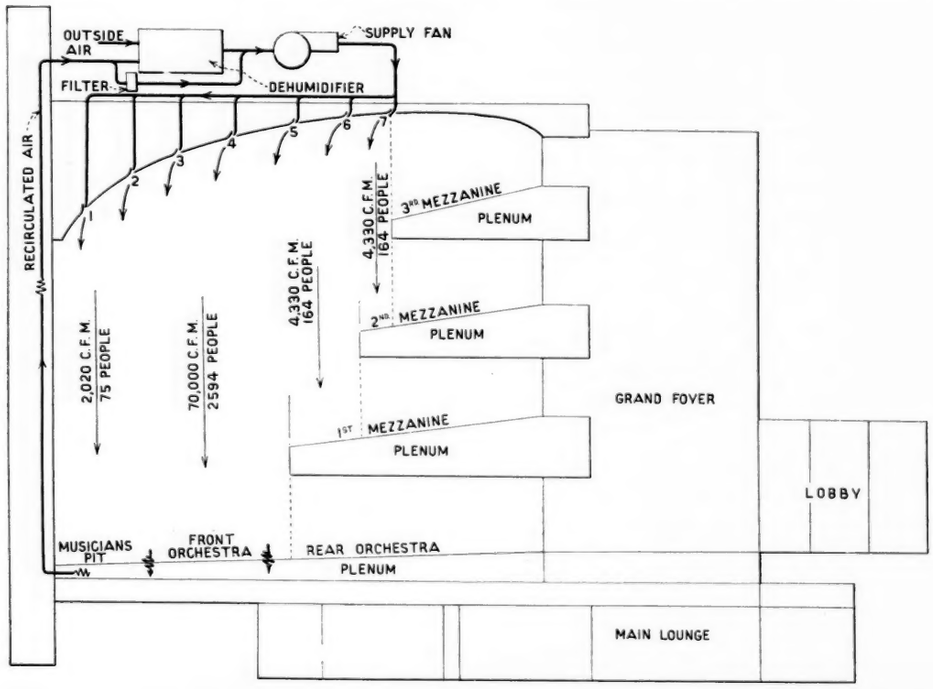



**Fig. 3. Capacities and areas served by System A.**

TABLE 2
CAPACITIES OF THE THREE SYSTEMS

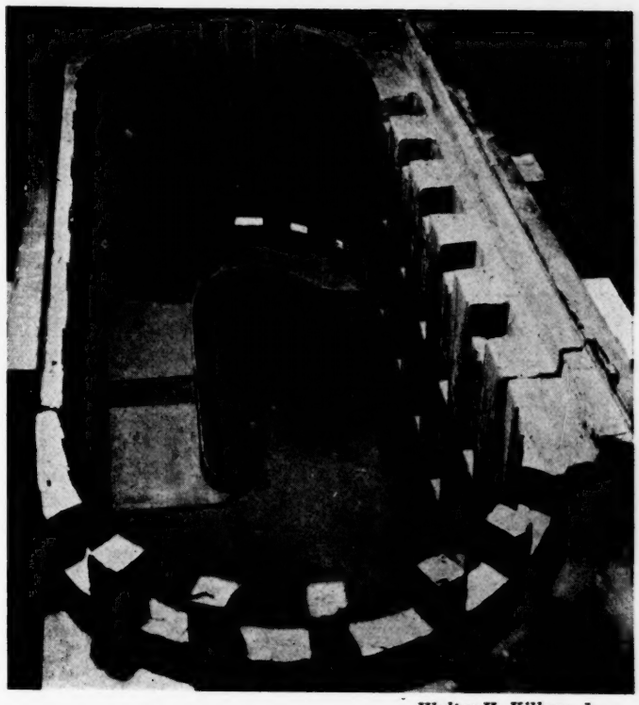
| System | Section Conditioned | Population | Air Supply, c.f.m. | Approx. c.f.m. per person |
|---|---|---|---|---|
| A | Front orchestra | 2594 | 70,000 | 27 |
| | First mezzanine (front) | 164 | 4,330 | 27 |
| | Musicians' pit | 75 | 2,020 | 27 |
| | Second mezzanine (front) | 164 | 4,330 | 27 |
| B | Rear orchestra | 1200 | 28,620 | 24 |
| | Rear orchestra (standees) | 300 | 9,000 | 30 |
| | Grand foyer (1/3) | 300 | 9,330 | 31 |
| | Lobbies | 152 | 4,370 | 29 |
| | Main lounge | 450 | 14,400 | 32 |
| | First mezzanine (rear) | 778 | 23,340 | 30 |
| | First mezzanine promenade, etc. | 165 | 5,350 | 32 |
| C | Second mezzanine (rear) | 689 | 20,670 | 30 |
| | Second mezzanine promenade, etc. | 120 | 3,930 | 32 |
| | Third mezzanine | 683 | 21,990 | 32 |
| | Third mezzanine promenade | 50 | 1,500 | 30 |
| | Grand foyer (2/3) | 600 | 18,350 | 30 |

without use of mechanical refrigeration so long as outside air does not exceed 48° wet bulb temperature, which is below the theater dew point. This is accomplished by admitting a high percentage of outdoor air through specially designed combination dehumidifiers and air washers. Should outside climatic conditions permit, 100% outside air may be introduced.

## System A

System A supplies air to the front orchestra, musicians, and a portion of the first and second mezzanine, as indicated in Fig. 3. The summary of engineering data is outlined in detail in Table 2. This system employs but one fan which acts as both supply and return.

A special feature of the system is the method used to vent the exhaust air. On each side of the main orchestra a series of exhaust air louvres and dampers has been installed. These function automatically with the large outside air dampers. When the maximum amount of outside air enters the theater, a like amount of used air is exhausted through this relief. When the minimum amount of fresh air is being circulated, the used air is exhausted at the floor through special chair exhausters which convey this air to a large plenum and then to the conditioning apparatus. These exhausters are located throughout the main orchestra floor, approximately 20% being evenly distributed at the front third of the orchestra, 30% in the middle portion, and 50% in the balance of the space. The purpose of this arrangement is to keep a balanced condition of temperature, humidity and air motion throughout the main orchestra.



*Walter H. Kilham, Jr.*

**Fig. 4. Architect's model—interior of grand foyer**

## Systems B and C

Systems B and C are similar to A with the addition of the exhaust fans. This arrangement maintains an air balance at all times in the sections served, especially when maximum outside air is used. All of the supply and exhaust fans are of the constant speed type. The arrangements are shown in Figs. 5 and 6. To operate the fans at reduced speed and air volume is apt to produce spotty, drafty conditions and, in time, a stuffy odor throughout the theater. Separate smoke exhaust fans are installed to remove the smoke from the second and third mezzanine, and the main lounge.

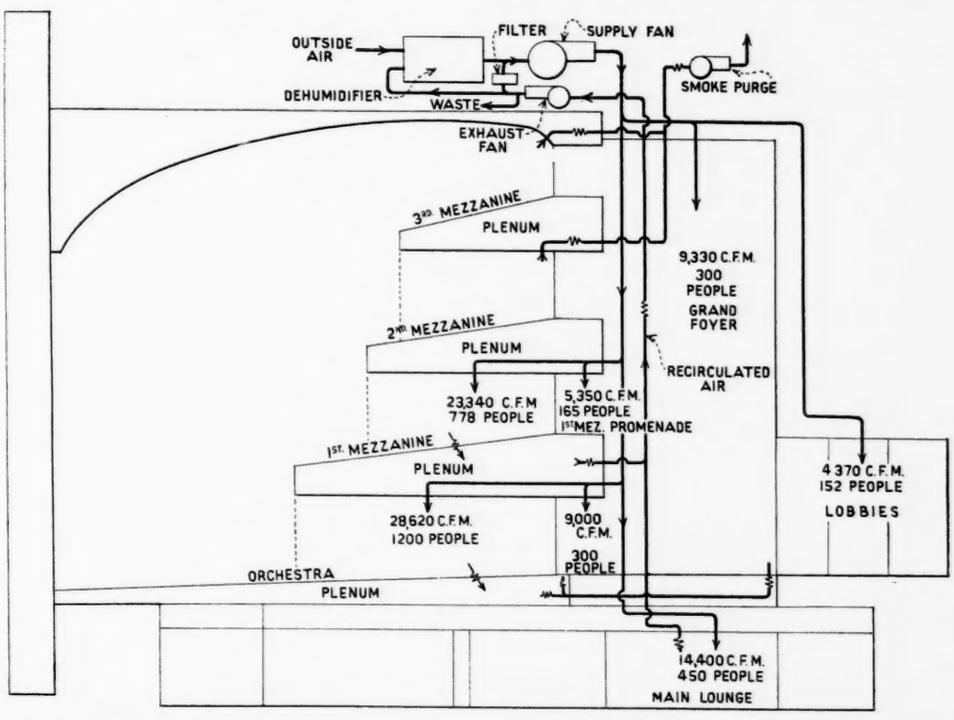



**Fig. 5. Capacities and areas served by System B.**

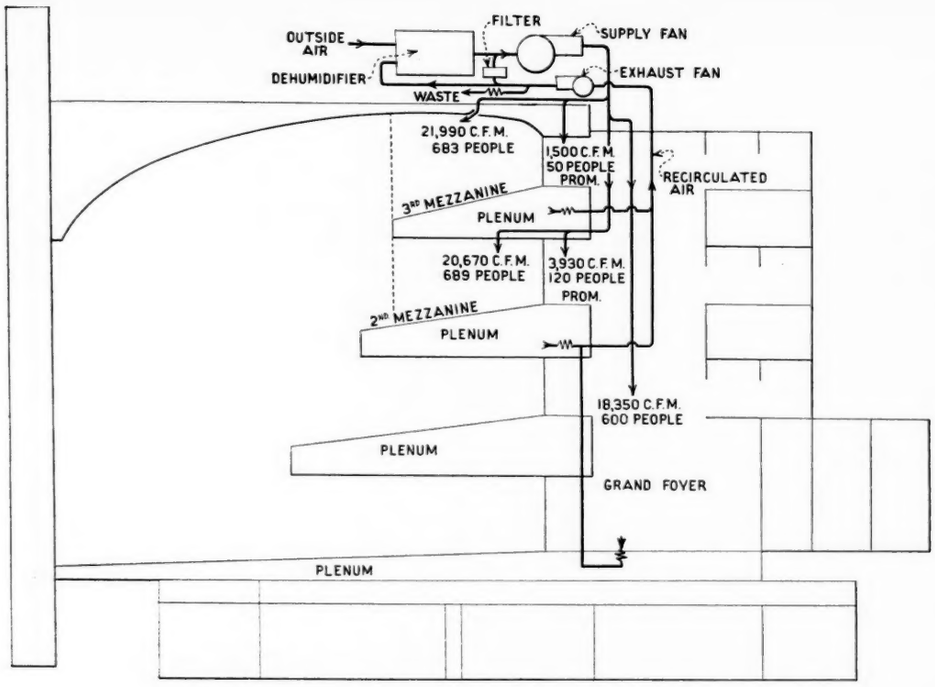



**Fig. 6. Capacities and areas served by System C.**

## Air Conditioning Apparatus

The refrigeration machinery is located in the basement, the other conditioning apparatus being on the sixth floor. There are three complete systems of centrifugal refrigeration installed, the refrigerant being dichloromethane. Whenever the theater is not fully occupied, and when weather conditions permit, each system may be run at reduced capacity, or any unit may be cut out entirely. This arrangement provides for efficient and economical operation. The machinery room was designed so that ample space has been provided for operation and minor repairs. Space has also been provided for the removal of any section of the equipment which may require extensive repairs or replacement. Automatic temperature control of the refrigerated water is obtained through a single duty temperature regulator and thermostat which controls and regulates the condenser water by actuating a reverse acting regulating valve. The amount of water passing through the cooler is controlled by a differential electric control which regulates the performance of the liquid pump. An orifice plate is inserted on the suction side of the cooler and the difference in pressure on either side of this orifice plate starts or stops the liquor pump. The entire cycle of refrigerant is under a vacuum.

The cold water piping has been installed as a closed water system using the dehumidifiers as balancers. Only one cold water circulating pump is used. The velocities at no point exceed 8 ft. per sec. in the pipes. A special feature of the piping system is the arrangement of flooding nozzles installed in the combination dehumidifier washer. Cold water is recirculated by an independent pump to these nozzles which cleans the air along with the dehumidifying spray nozzles. A complete system of water treatment equipment has been installed for rust prevention.

In addition to the city water, a modern condenser water cooling system has been installed to cool approximately 1776 gal. of condenser water each minute. Separate cooling towers have been installed for each refrigeration machine. Due to space available and architectural treatment, tower A is the forced type, while towers B and C are the induced type.

TABLE 3
UNIT DATA FOR THE AIR CONDITIONING DESIGN

| Item | System A | System B | System C | Total |
|---|---|---|---|---|
| 1—Number of people..... | 2,997 | 3,150 | 2,097 | 8,244 |
| 2—Outside air, min., c.f.m. | 32,350 | 37,785 | 26,570 | 96,705 |
| 3—Return air, c.f.m..... | 31,400 | 33,715 | 26,080 | 91,195 |
| 4—Dehumidified air, max., c.f.m. ..... | 63,750 | 71,500 | 52,650 | 187,900 |
| 5—Recirculated air, min., c.f.m. ..... | 48,330 | 56,985 | 39,870 | 145,185 |
| 6—Total air supply, c.f.m. | 80,680 | 94,770 | 66,440 | 241,890 |
| 7—Tons of refrigeration.. | 246 | 205 | 141 | 592 |
| 8—Cold water, g.p.m..... | 843 | 703 | 484 | 2,030 |
| 9—Preheat condensate, lb. per hr. ..... | 1,150 | 1,350 | 950 | 3,450 |
| 10—Reheat condensate, lb. per hr. ..... | 3,130 | 3,310 | 2,345 | 8,785 |
| 11—Condenser water, g.p.m. | 738 | 615 | 423 | 1,776 |
| 12—Cooling tower, c.f.m... | 102,000 | 86,000 | 58,000 | 246,000 |
| 13—Smoke exhaust, c.f.m.. | None | 5,000 | 5,000 | 10,000 |
| 14—Air supply per person, c.f.m. ..... | 27 | 30 | 32 | 29 |
| 15—Outside air per person, c.f.m. ..... | 11 | 12 | 12½ | 11½ |
| 16—Number of persons per ton of refrigeration. | 12.2 | 15.4 | 14.9 | 13.9 |
| 17—C.f.m. air supply per ton of refrigeration. | 328 | 461 | 470 | 410 |

## Noise Prevention

The theater-going public is becoming more and more noise conscious, so much so that present-day air conditioning installations must give due consideration to noise prevention. Modern theaters equipped with the latest and most modern sound picture projectors demand and require absolute quiet. The plans and specifications for the Music Hall limited the increase in noise level due to the operation of the conditioning equipment to not more than 5 decibels above normal room noise level.

In order to obtain these results all of the apparatus, foundations and ductwork were carefully insulated for noise prevention as well as heat insulation. Special care was given to the number and location of all sound absorbers. All piping connections between pumps, coolers and condensers are insulated with flexible rubber joints for noise and vibration prevention. The fans are also insulated, and canvas connections have been provided to all ductwork.

Wolff & Munier, Inc., are the heating contractors for the building.

# A.I.A. Committee Condemns Present Ventilation Standards

THE following resolution was adopted by the executive committee of the American Institute of Architects at its meeting held February 26-27:

Whereas, present laws and regulations relating to the ventilation of buildings require a tremendous annual expenditure for ventilating equipment, involving the health, welfare, and comfort of the general public, and

Whereas, the prevailing standards of practice in the ventilation of buildings are not supported by proven scientific facts, and

Whereas, competent hygienists and medical authorities, on the basis of authentic physiological data from reliable sources, are not in agreement with heating and ventilating engineers, and

Whereas, this chaotic condition has created a widespread dissatisfaction in the public mind regarding methods of ventilation, resulting in many objections to the present engineering practice, now therefore be it

Resolved, that the American Institute of Architects recommends the revision or repeal of present codes and regulations relating to the ventilation of buildings, wherever such codes and regulations are not supported by rational and authentic physiological data acceptable to both the hygienist and the engineer, and be it

Resolved, that the American Institute of Architects is opposed to the promulgation or adoption of further codes, requirements, regulations or standards for ventilation until such time as an agreement between recognized authorities in the medical and engineering professions has been reached regarding the necessary minimum standards for ventilation, and be it further

Resolved, that the American Institute of Architects favors the creation of a national movement to determine the factors to be considered in maintaining the health, comfort, and safety of the occupants of buildings as affected by ventilation and that these factors, when determined, shall be used as the basis for a ventilating code of fundamental minimum standards generally applicable in all communities, and be it further

Resolved, that the secretary be instructed to send a copy of this resolution to the boards of directors of the American Society of Heating and Ventilating Engineers, the American Standards Association, the American Public Health Association, the United States Public Health Service, the American Medical Association, the Ohio State Association of Architects, and the secretaries of all chapters of the Institute, and that copy of this resolution be printed in "The Octagon."

## Mersey Tunnel Studies on Ventilation and Fire

ENGINEERS responsible for the design and construction of the new vehicular tunnel under the Mersey River, in England, which is to connect Liverpool and Birkenhead, engaged in some elaborate experimentation in their endeavor to determine the best method of ventilation. These investigations were centered more on the probable actions of an accidental fire within the tunnel than on the problem of keeping the carbon monoxide content at a safe dilution. It is evident that if a volume of fresh air sufficient to dilute the carbon monoxide content to a safe degree be introduced at a uniform rate along the tunnel, and the same volume extracted from the tunnel, it is unimportant whether air movement be transverse or longitudinal, so long as the air movement is not excessive.

In the case of fire, however, a purely transverse air movement would tend to localize the trouble, while longitudinal movement might result in a source of danger from smoke and flame being carried along the tunnel. For the experiment, a section of the completed part of the tunnel was apportioned off, and a fan having a capacity of 300,000 c.f.m. was connected to the duct below the roadway, and another of the same capacity was connected to the top of the tunnel. Bales of hay, and quantities of gasoline were then fired within the tunnel, and during part of the experiment, a steam boiler producing heavy clouds of smoke was moved through the tunnel. Observations to determine the detailed behavior of air currents were then made with the aid of smoke candles. In this way, a study was made of the effects of a fire with the various directions and combinations of air flow under consideration for ventilating the tunnel prevailing.

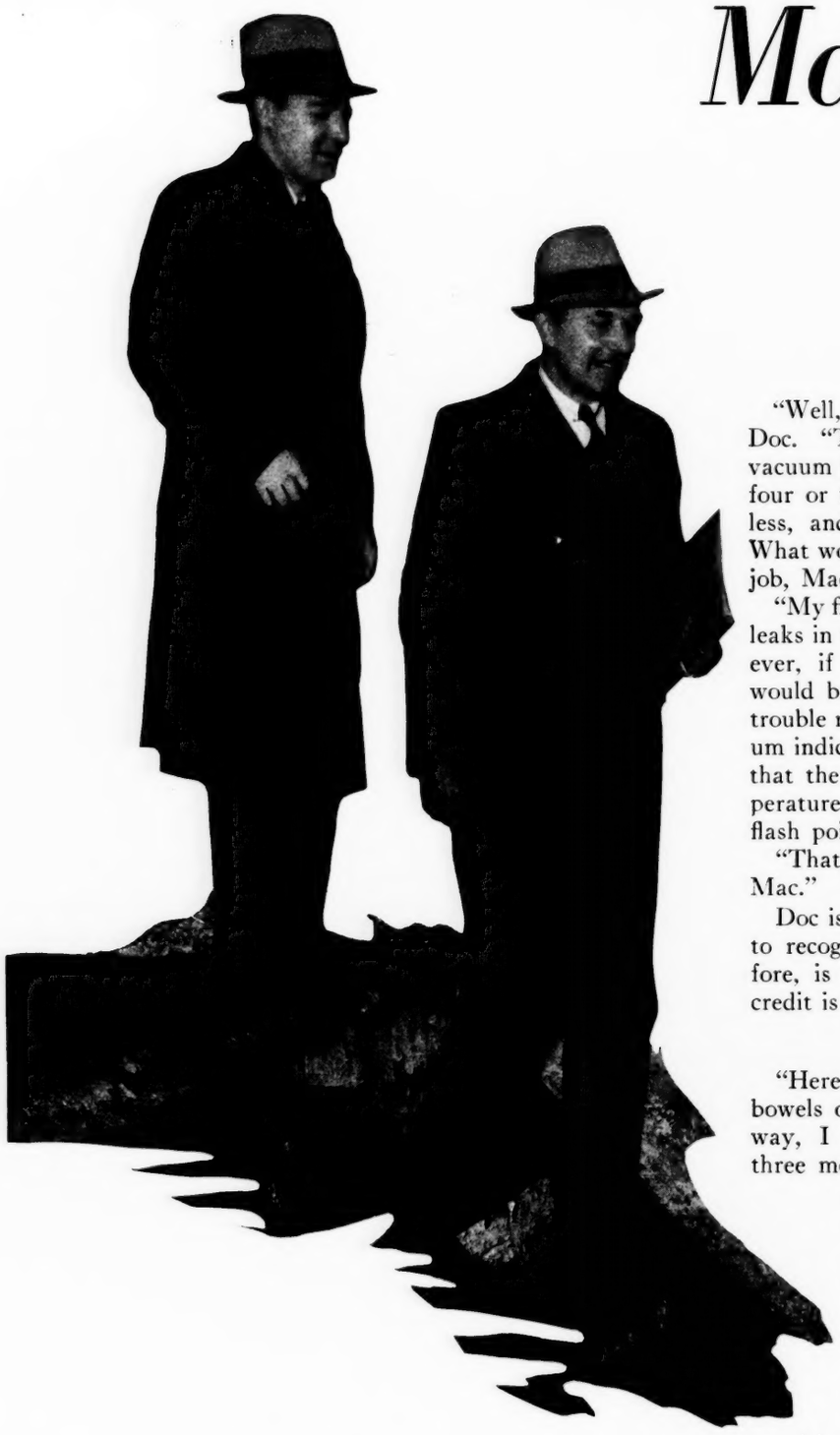
As a result of the investigations it was decided to use the upward transverse system of ventilation. With this method, the upper duct for vitiated air is omitted, so that incoming fresh air, introduced from the duct beneath the roadway, progresses longitudinally along the tube as it rises toward the top. Elimination of this exhaust duct has several advantages, among them being a substantial saving in construction cost, a reduction of noise and echo, and an improved appearance.

Six ventilating buildings, three on each side of the river, will house the blowing and exhaust fans. Each fan will be in duplicate, and each capable of carrying the maximum load in the section of tunnel it serves. The maximum duty of the fans was determined by assuming each automotive engine to exhaust 100 cu. ft. of carbon monoxide per hour, and that sufficient fresh air must be introduced to maintain the carbon monoxide dilution below two and a half parts in 10,000, with cars 75 ft. apart. This proportion may rise to four parts in 10,000 for short peak periods of traffic.

Twenty-nine fans will be used; 18 for blowing, and 11 for exhaust. Nine blowing fans, and six exhaust fans are sufficient to carry the load at any time.—*Institution of Municipal and County Engineers Journal*, London. March 15, 1932.

# *Making the H with a*

**Part II.**



***What Has Gone Before***

***Doc White, the service engineer for a large heating contractor, has hired a new assistant, McKay, who has a fair idea of the theory of steam heating, but no practical experience. Doc explained to him the elements of vacuum heating, and illustrated a simple vacuum system. They are now in Doc's office.***

"Well, here is the first trouble report," said Doc. "This man states that the automatic vacuum pump on his heating system pulls only four or five inches of vacuum and sometimes less, and that the pump runs continuously. What would you say has gone haywire on this job, Mac?"

"My first guess is that there are some serious leaks in the system," ventured McKay. "However, if leaks exist, the inward flow of air would be more or less constant, and since the trouble report states that there is a lesser vacuum indicated at times, I am inclined to believe that the traps are leaking and that the temperature of the condensate has reached the flash point corresponding to the vacuum."

"That is fine deduction and quite logical, Mac."

Doc is broadminded and considerate enough to recognize intelligence in others and, therefore, is wise enough to bestow credit where credit is due.

* * * *

"Here is the job, so let's descend to the bowels of the brute and look around. By the way, I have revised the philosophy of the three monkeys to read, 'see all evils, hear all evils, but say nothing until you are sure.' "

The "job" consisted of three buildings, two old ones and a recent addition, connected by an enclosed walk at ground level. The boilers and vacuum pump used on the old system were abandoned because the recent addition was a large building requiring much larger capacity to supply it. The new boiler room was located in the basement of the new building. The steam main serving the two old buildings was suspended in the covered walk and the return main was buried in tile under ground.

As they entered the boiler room they met the janitor and explained the purpose of their visit.

"Why, them gosh blamed vacuum pumps don't work right," said the janitor. "Sometimes they pull a vacuum and other times they get so hot you can't touch 'em. Must be somethin'

# e Rounds a SERVICE Man

By
V. D. Milliken

wrong with 'em else they wouldn't get so hot and keep a runnin'. I tried to get the boss to throw 'em out, but a feller can't tell him nothin'. You know how it is with them guys."

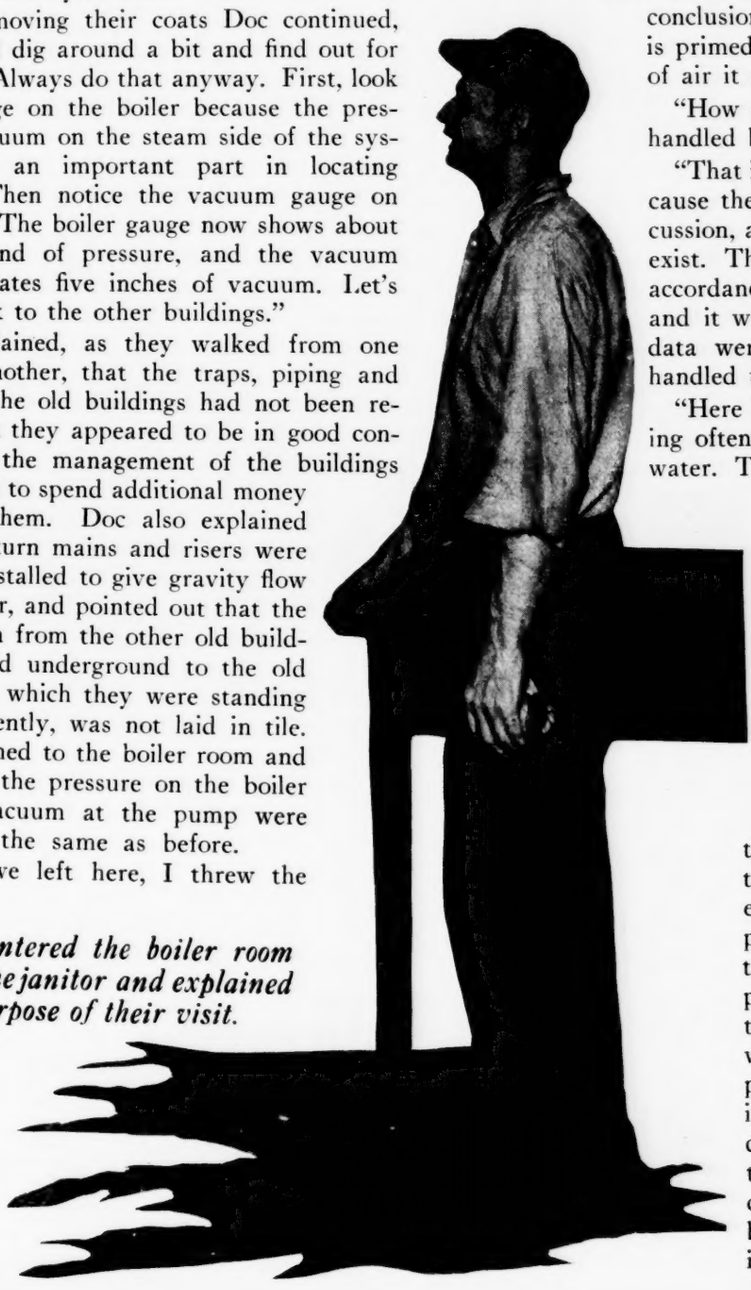
"Sure, I get you," replied Doc. "While you are busy with your duties, we'll look around a bit."

When the janitor had departed, Doc said, "An appropriate addendum to the monkey philosophy is, 'don't believe all you hear.'"

After removing their coats Doc continued, "Now, we'll dig around a bit and find out for ourselves. Always do that anyway. First, look at the gauge on the boiler because the pressure or vacuum on the steam side of the system plays an important part in locating troubles. Then notice the vacuum gauge on the pump. The boiler gauge now shows about a half pound of pressure, and the vacuum gauge indicates five inches of vacuum. Let's take a walk to the other buildings."

Doc explained, as they walked from one place to another, that the traps, piping and fittings in the old buildings had not been renewed, that they appeared to be in good condition and the management of the buildings had refused to spend additional money to repair them. Doc also explained that the return mains and risers were properly installed to give gravity flow to the boiler, and pointed out that the return main from the other old building returned underground to the old building in which they were standing and, apparently, was not laid in tile. They returned to the boiler room and noted that the pressure on the boiler and the vacuum at the pump were practically the same as before.

"When we left here, I threw the switch on the pump to continuous operation so it wouldn't stop while we were gone, and the vacuum isn't any greater than before. How do you account for that, Mac?"



*As they entered the boiler room they met the janitor and explained the purpose of their visit.*

"I would say that there were leaks in the return line which admitted air at the same rate that the vacuum pump was removing it," replied Mac. "Either the pump is too small or the leaks are too great."

"That is correct, although before arriving at that conclusion, you should be sure that the pump is primed and that it is handling the quantity of air it should."

"How do you determine the quantity of air handled by the pump?" asked Mac.

"That is a tough question," replied Doc, "because the methods now used are open to discussion, and considerable differences of opinion exist. The methods now employed are not in accordance with actual operating conditions and it would help to clear up the situation if data were published showing the quantities handled under actual operating conditions.

"Here is the procedure for a method of testing often employed: Fill the pump with cold water. Then place a number of different sizes of orifices one by one on the suction side of the pump while it is running, and the vacuum on the vacuum gauge is noted for each size of orifice. Of course air is admitted only through the orifice, all other points of admission having been closed. The quantity of air passing through the orifices, at the vacuum noted for each orifice, is determined from existing curves which show the quantity in cubic feet per minute. Incidentally, the results obtained can be expressed in terms of air in the expanded state at the vacuum referred to, and presumably dry air at a temperature of seventy degrees. From these data, a curve may be plotted which shows the volume in cubic feet per minute against the vacuum in inches of mercury. Such a curve indicates the volume of air handled by the pump at any vacuum. The curve can be plotted over a range of vacuum, but is of most interest over the operating range. In order to perform their

duty, pumps may have to operate at from two inches to as high as eight or ten inches of mercury, depending on the particular installation."

"Are we going to run an air test on this pump?" asked Mac.

"No, I don't think that will be necessary because this pump is new," replied Doc, "but some pumps should be tested if they have been in use for a year or two and you suspect their ability to handle a sufficient quantity of air. Having decided that this pump is O.K. regarding capacity, operating water, direction of rotation, and other obvious details, the only logical conclusion is that there are rather serious leaks in the return line. Therefore, by process of elimination, we will try each return line and determine the probable location of the leak. Close that valve in the return line which comes from the old buildings, and we'll watch the vacuum gauge. There she goes—six inches—seven inches—click, and the pump has stopped. Notice that the vacuum is not decreasing. That indicates that the system in the new building is tight, and that the leak must be in the return lines of one, or both, of the old buildings. Open that valve which you closed, Mac, and we'll walk over to the old buildings again. I'm quite sure where the leak is, but until you have had more experience, I want you to follow the process of elimination which is sure but not quite so rapid."

Upon arriving in the old boiler room, Doc closed the valve in the return line, which was buried underground, from the second of the old buildings and returned to the new boiler room. The vacuum had dropped to about three inches during their absence, and rather than wait until the vacuum dropped sufficiently low to start the pump automatically, Doc tripped the vacuum regulator in manually.

"Four—five—six—seven and out. Now, Mac, you run over and open the return valve from old building number two, which we just closed, and then close the return valve from old building number one."

While Mac was away, Doc closed the return line from the new building and then admitted air into the return lines to lower the vacuum to about five inches. He had just completed these tasks when Mac returned.

"I have just closed the return valve from the new building, and you have shut off old building number one, so the pump will be pulling only on vacuum. indicated at the pump, to five inches because that was our reading when we arrived and we know that we will not get a lower one now."

Doc again tripped the vacuum regulator in manually and they watched the vacuum gauge. About five minutes elapsed before the gauge indicated six inches of mercury. Another ten minutes had passed and the vacuum had managed to creep up to six and one-half inches of mercury.

"Well, you certainly have demonstrated that the leak is in old building number two," said Mac.

"Or in the return line buried underground from old building number two, to old building number one, eh?" added Doc.

"Do you mean that the return pipe has rusted away because it's buried in the ground?"

"Exactly," replied Doc. "That pipe was buried in the same manner, and with the same care as is exercised when burying a dead rat. I have known of cases where underground pipe was laid in cinders. When the sulphur in the cinders combined with water, you know the rest of the story."

"Gee, this job was interesting," exclaimed Mac. "Where is the next job located?"

"I can see that you will like this kind of work, Mac, but don't let your enthusiasm rob you of your better judgment," rebuked Doc with a smile. "Before we got here, you suspected that the temperature of the condensate might become great enough to kill the vacuum produced by the pump, so we had better try that out."

"Thanks for telling me in such a nice way that I'm a first-class jackass," responded Mac, appreciating the remark.

"Let that be a lesson to you never to leave a job until you have observed details under all operating conditions. It isn't always possible to correct a system on the first visit, but you are at least familiar enough with it to recommend a remedy for the trouble without needless visits. Now, you go over and open that valve you just closed and I will open this one here."

Doc then opened the draft on the boiler and in a short while the pressure on the boiler began to rise. He inserted a thermometer into the accumulator tank through a water colum connection, the opening of which accommodated the adapter piece of his thermometer. The temperature recorded at that time was one hundred and sixty degrees, and the vacuum gauge indicated five inches of mercury. Presently, the temperature of the condensate returning from the system began to rise rapidly.

"Take a look at that thermometer, Mac," said Doc. "We have about six pounds pressure on the boiler and some steam is passing the traps. That temperature is almost two hundred degrees now, and the vacuum has fallen to about two inches. The leaks in the line and the leaking traps combined, prevent the vacuum pump pulling a higher vacuum, therefore it will run continuously on vacuum control. The traps in the old buildings were not inspected and cleaned, so I imagine that the return line from the old buildings will be mighty hot, while the return from the new building will be comparatively cool."

"Ouch, you're right," exclaimed Mac, removing his hand quickly.

"Well, I think we can go now," said Doc after removing his thermometer and reconnecting the water column. "I don't think anything further will happen on this job because it has an equalizing line connected, and a few other gadgets installed to prevent other troubles. I'll write a report to the building management, recommending that the traps be thoroughly cleaned or replaced where necessary, and that the leaking return line be replaced with a new one which is protected."

"What is the equalizing line that you spoke of, Doc?" inquired Mac.

"I believe that the next job we are going to will require an equalizing line, judging from the nature of the report," replied Doc, "and you will understand the effect of such a line if you first observe the cause for it."

[*Next month Mac becomes greatly puzzled on a trouble job with an oil-fired system, and learns what an equalizing line is.*]

# EDITORIAL

## Ventilation Standards

THE recent resolution of the governing committee of the American Institute of Architects on ventilation standards, which is reprinted in full elsewhere in this issue, favors (1) repeal of existing codes, (2) a holiday of new legislation and new code-making or standard-making, and (3) a comprehensive movement to learn the fundamentals in order to draw up a fundamental code.

With this three-part proposal we are thoroughly in sympathy with one part, partly so with another, and out of sympathy with a third.

The most sensible part of the resolution is that which advocates a holiday of code-drawing, legislation, and standard-making. Particularly is this true where such codes, standards, and other pronouncements are merely the work of small groups who necessarily represent specialized, and often biased, viewpoints. This is equally true whether the group be engineers or hygienists. In the past, organized groups of each profession have considered the question of ventilation standards, and each has proposed codes and statements. None of these bear the earmarks of dealing in real fundamentals. Instead they rather naturally represent the ideas which their small groups of supporters like to regard as fundamental. Neither group has as yet succeeded in convincing the other that its ideas are either fundamental or sound in practice.

This reflects no discredit on either group. It merely reveals that there is a lack of knowledge and information on the whole subject. How can an agreeable code be drawn in terms of fundamentals when the fundamentals themselves are the subject of disagreement?

That is the present situation and that is why we wholly agree with the proposal that a holiday be called, with all the parties interested recognizing that a finally agreeable and acceptable statement is not now possible.

This brings us to that part of the proposal which deals with the creation of a national movement to determine the fundamental factors of ventilation.

We agree with the general idea and would be wholly in agreement, and even enthusiastic advocates, if we could be sure that such a national movement could be so organized that it would be proof against "packing"; that it would not merely degenerate into a committee determined to force over some kind of a statement to save its own face; that its personnel would be above reproach and broad enough to really recognize fundamentals and not be confused by mere practices or by scientific smoke screens, no matter by whom thrown out, and that the organization would recognize the difficulty of its assignment, the importance of its conclusions, and the necessity for taking ample time for its efforts.

We repeat, we would be wholly in favor of such a movement if these conditions could be insured. But can they? That certainly remains to be seen and, consequently, we cannot agree wholly with this part of the proposal at present. We are even inclined to seriously doubt if such a movement could be given sufficient flexibility and command the services of a sufficiently high grade personnel to make it successful. Until this is more evident we must withhold endorsement in full.

In the matter of the repeal of existing codes and laws, none are more fully aware than we of their shortcomings and of their archaic nature. They are merely relics of what were considered models twenty-five years ago. They have often stood in the way of progress. They themselves are good examples of why inflexible rules should not be enacted into laws. Yet we are not in favor of their immediate repeal without substitutes of any kind.

The reason for this is evident on but little consideration. We may as well recognize that we are far from agreement as to the real fundamentals of ventilation. True, there are those who for years have been reiterating that the three overworked items of temperature, humidity and air motion tell the whole story. It takes but little thought to realize that this cannot possibly be true. The work of finding the real fundamentals and securing agreement upon them will necessarily be a long job. If we repeal the existing codes there will thus necessarily be nothing left for a long period of years while we wait for the solution of this enigma of what the fundamentals of ventilation really are. We believe that such a state of affairs will not work to the advantage of anyone. Therefore, we do not favor immediate repeal without temporary substitutes.

We are of the opinion that sufficiently good temporary substitutes for the existing codes and rules can be drawn in comparatively little time so that their use will bridge over the gap between the admittedly bad present situation and that ideal one which will be possible only when all the real fundamentals are known. The essential point is that if such substitutes are drawn —and it matters little by whom the actual preparation is done—they should be acknowledged frankly as temporary and as representing current ideas only. We believe that any attempt to disguise our purely transient information into principles is misleading and should not be tolerated.

Instead of the proposal outlined by the Institute's committee we believe that a more fundamentally correct one would advocate (1) repeal with admittedly temporary substitutes until a permanent form can be secured, (2) a holiday of code-drawing and legislation when these attempts are merely propagandistic and small group ideas, and (3) a survey of the field to see what can be done about a continuing organization which can eventually determine and fairly evaluate the true fundamentals.

# Abstracts . . .

**Reviews and Summaries of . . . . Current Papers, Books and Pamphlets**

## Home Finance and Taxation

**A publication of the President's Conference on Home Building and Home Ownership, and volume two of a series; cloth-bound; 6 in. x 9 in.; 292 pages; obtainable through the conference, Commerce Building, Washington, D. C.; price, $1.15.**

Contains a reprint of the reports of two committees of the conference held in December, 1931. The committees were made up of specialists in their respective fields of home finance and taxation. The reports represent their joint statement of fundamentals and methods.

This has resulted in a volume which should serve for years to come as an indispensable handbook for realtors, economists, life insurance and mortgage companies, building and loan associations, banks, tax assessors, and other municipal officials, as well as for civic leaders concerned with problems of public welfare.

Five appendices are published with the finance report and eight with the report on taxation. These are important, original studies the material of which has not previously been accessible to the reading public.

●

## Ice in Air Conditioning

**By F. J. Moelter**

**From "Refrigeration," Atlanta, Ga.; March, 1932; pages 26-28; 1500 words.**

Discusses the economic feasibility of ice as a refrigerant in moderate sized air cooling and air conditioning plants. It is stated that lowered first cost, a result of the elimination of compressor, condenser, receivers, evaporators, etc., so reduces fixed charges that operating costs are decreased as much as 40% in some cases.

Records of a test made in a New York theater, using ice as a refrigerant, are quoted as follows: Test made on a July day, with temperature in the street at 85° F., and the outside relative humidity at 50%. The dry bulb temperature in the house was maintained at 75° and the wet bulb at 65°, or a relative humidity of 58%. Based on the Harvard School of Public Health investigations, these conditions corresponded to 16% comfort in the street, and 95% comfort in the theater. Attendance was 400 at the time of the test. Approximately seven tons of ice were consumed during the 12 hr. the equipment was in operation. During July and August, the consumption averaged 3.5 tons per day.

Figures are presented giving the results obtained from an office installation at Freeport, in which a total space of 10,000 cu. ft. is cooled by means of unit coolers, blowing above the heads of the occupants. Cool water is obtained by placing a supply of ice in a tank and spraying the warm water returned from the coolers over it. On the warmest days, the temperature did not exceed 78°, with relative humidity at approximately 55%. No electric fans were used, circulation being provided only by three-speed fan motors in the coolers. Installation cost was $800, and ice consumption was about 150 lb. per hr. of operation, with the outside temperature in the neighborhood of 90°.

●

## Engineering Handbook for Building Heating by Gas

**Black fabrikoid covered; flexible; loose-leaf; sheets punched to Lefax spacing; 89 pages; 3¾ in. x 6¾ in.; binder 4¼ in x 7¼ in. or pocket size; published by the New Jersey Gas Association and prepared under the direction of a committee. Obtainable from New Jersey Gas Association, 80 Park Place, Newark, N. J.; price, $2.**

The handbook is the result of a realization that a gas salesman must have his technical information quickly available in a usable and compact form. As the book is frankly designed for the use of salesmen, information of use to them constitutes the material, much of which is in tabular and graphical form. Enough information is included to permit making an estimate of the heating requirements, to indicate the necessary size of equipment, and to prepare a gas consumption estimate. Apparently, the idea is that the salesman will be able to do these things quickly and right on the spot.

Tables and charts are well prepared, are compact and clear. Chart reproductions are in some cases too small for convenient use. While most of the material is suitable for general application, tables of degree days include the principal New Jersey cities only.

●

## Handbook of the National District Heating Association

**The second edition of this reference book in bound form instead of the loose-leaf form used in the previous edition; 6 in. x 9 in.; fabrikoid; 538 pages; illustrated. Obtainable by addressing the secretary at Greenville, Ohio, or through HEATING AND VENTILATING; price, $5.**

The book, which is written in text-book style, is published in the interests of the members of the association but contains information and data of value to all interested in the subject of building heating. Much of the material results from the studies and experiences of the members, although a considerable amount of general reference data is included.

A chapter devoted to heating systems describes the intended and proper functioning of the modern systems of steam heating. This is a unique feature of the book.

The chapter on economical use of steam is the first place where much of this information which has been gathered by the association has been collected, collated and made available in one place. The book thus con-

tains not only the latest data available on heating system operation, but is the only American book on the general subject of heating and ventilating which pays any particular attention to operation as differentiated from designing data. Steam consumption figures found necessary with proper heating methods are presented for many building types and with many methods of controlling operation. Examples are presented of the savings which have been found possible when good operation and control are used.

Service hot water quantities and the heating surfaces necessary to secure adequate heating of this water are items on which there has been a dearth of information. Data on these subjects are included to the extent of showing the water quantities found necessary in several classes of buildings and data whereby water heating economizers may be sized.

While the book as a whole is devoted largely to the use of steam and to the practices of the utility companies, it contains a section on hot water heating, and much of the subject matter is equally applicable to the generation, distribution and use of steam for industrial and institutional central heating installations.

The chapter headings are as follows: Growth and Present Status; General Data; Building Heating Methods; Customers' Miscellaneous Equipment; Steam Distribution; District Heating Plants; Steam Meters and Metering; Hot Water Heating; Corrosion in Steam Heating Systems; Rates; Sales Activities; The Economical Use of Steam; Equipment Section.

●

## Performance of Convector Heaters

**By A. P. Kratz and M. K. Fahnestock**

**An A.S.H.V.E. paper resulting from laboratory work at the University of Illinois; presented at the annual meeting, January, 1932.**

Describes tests made on four convector heaters, a 3-tube cast iron radiator enclosed in three types of cabinets, and an unenclosed cast iron radiator. All these were placed in test rooms and were manipulated to keep a temperature of 68° at 30 in. above the floor, while the test room was subjected to an outside air temperature of slightly under zero. The testing plant is the one used for some years in similar tests.

Conclusions are as follows:

1. The four types of convector heaters, having cabinets of approximately the same height, did not differ essentially in performance characteristics.
2. The convector heaters produced temperatures slightly lower in the zone from the floor to the 30-in. level, higher in the zone from the 30-in. level to the 7-ft. level, and either the same or slightly lower in the zone above the 7-ft. level, than those obtained with the unenclosed 26-in., 5-tube cast iron radiator.
3. The convector heaters maintained a temperature of 68° at the 30-in. level with steam condensations ranging from 1.5% to 7.1% less than the steam condensation required by the unenclosed 26-in., 5-tube cast iron radiator.
4. A 26-in., 3-tube, cast iron radiator enclosed in a cabinet of similar type and conforming approximately to the space requirements of the cabinets used with the convector heaters, exhibited the same performance characteristics as the convector heaters.

●

## Analytical Calculation of Complicated Air-Duct

**By P. N. Kamenev**

**Paper-covered pamphlet; illustrated. Carries no English publication notice but is "Edited by the Author". In preface the author states that permission to use his work may be obtained by addressing P. N. Kamenev, Stalino, Ukraine S. S. R.; 53 pages and appended charts; 8½ in. x 12 in.; no price stated.**

The author has developed two charts, or tables, by which he is able to calculate the sizes and pressures of a complicated duct system. He shows that by the use of his proposed method he is able from pure reasoning to reproduce the resistances which Blaess obtained experimentally on such ducts. The pamphlet is divided into two parts—one discussing a method of calculating, using equivalent orifices, and the other using the methods of requalents of orifices.

It appears that the author has worked out a very much worthwhile method of attacking the problem of calculating ducts, but his demonstration is mathematical to an extent that makes his pamphlet anything but light reading. Unfortunately, this tendency toward mathematical analysis and demonstration is almost certain to work against his effort receiving any detailed consideration or discussion from engineers in this country in spite of the well-known shortcomings of our present methods. This is made worse from the fact that his tables are constructed in metric units, and anyone who attempts to apply them to an American example must make the unit conversions.

●

## Heat Losses Through Pipes Laid in Ground

**From "Der Waermeverlust on Rohrleitungen im Erdreich," by Dr.-Ing. I. S. Cammerer; Archiv fuer Waermewirtschaft, Berlin; No. 2, February, 1932; 5000 words.**

**ABSTRACTED BY A. A. BERESTNEFF**

Under certain conditions the earth near a pipe laid in ground may act as a good heat insulator. The insulating capacity of the earth depends largely on three factors: (1) kind of earth, (2) specific weight, and (3) moisture content. That part of the heat transmitted through the pipe (in the form of steam or hot water) and lost dries out the surrounding earth, and results in a decrease in the heat conductivity of the earth.

To investigate the relations, as well as to clear up other doubtful points such as the temperature distribution near the pipe, the author investigated certain cases of pipes laid in ground.

The tests were conducted using two pipes of 1.97 in., and two pipes of 11.8 in., inside diameter, and each 26

ft. long. One pipe of each size was laid uninsulated and the other was installed insulated, in a concrete or clay pipe with an air space inside. Saturated steam at a temperature of about 350° F., was used as a heating medium. Sixty thermocouples were used for measuring the temperatures around the pipe. The results were:

In the case of the 11.8 in. insulated pipe no drying effect was observed in the earth, but in the case of the 1.97 in. pipes, especially when uninsulated, so considerable a drying was observed that a large increase of heat insulating capacity could be expected. As found previously by W. Redenbacher, the conductivity of a loamy or clayey earth of about 124.8 lb. per cu. ft., and a moisture content of about 28%, was about 16.1 B.t.u. per sq. ft. per in. per °F., per hr. Tests made by Cammerer have shown that this value in the case of the smaller uninsulated pipes can be taken as about 4 to 4.85 B.t.u. for a zone as large as 9.85 ft. around the pipe. (For entirely dry sand of 118.5 lb. to 124.8 lb. per cu. ft. he gives a conductivity of 2.66 B.t.u.) In the case of the small insulated pipe the value can be assumed to be 8.064 B.t.u., but this should be checked by further tests. The temperature around the pipes was distributed not in a circle but in an ellipse with the larger axis horizontal and the smaller one displaced eccentrically downward.

The following conclusions are made by the writer:

1. The heat losses of the insulated pipes laid in the ground can be calculated by means of the usual equation for cylindrical surfaces assuming the acting zone of the surrounding earth to be equal to 9.85 ft. and the conductivity of earth (in a case of sand) equal to 8.064 B.t.u. per sq. ft. per in. per °F. per hr.
2. The insulating capacity of the earth reduces the economical thickness of insulation. Sometimes the thickness, as compared with a pipe in air, can be reduced one half.
3. The heat loss of uninsulated pipes should not be assumed greater than double the value of the heat losses of insulated pipes.
4. As to the zone of action the value of 9.85 ft. should be considered only for calculations of insulating capacity. The real distance (thickness of earth) on which the temperature influence can be observed is 16.4 ft.
5. The small thickness of insulation for pipes laid in ground may save the first cost of moisture-proof material. Therefore, direct location of pipes in the ground, as compared with free location in air or with location in channels, seems to be economically reasonable.

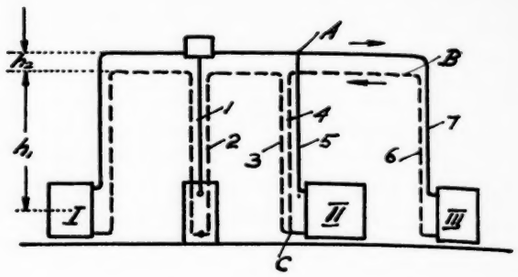
●

## Hot Water Heating System with an Overhead Return Line for Heating Each Floor Independently

**From "Stockwerks-Warmwasserheizungen mit Hochgefuehrten Ruecklaufleitungen", by A. Marel; Gesundheits-Ingenieur; No. 8, February, 1932; 1500 words.**

**ABSTRACTED BY A. A. BERESTNEFF**

The writer gives some theoretical considerations concerning a method of piping for heating each floor independently with the gravity flow connection shown in the drawing, a so-called "syphon" system.




As a result of his analysis, the writer concludes that this method of piping is preferable to an older one wherein the two return pipes, 3 and 4, of radiator II are united into one pipe going from the radiator to the overhead return B. An analysis of the pressure available in this latter case shows that the system is not as stable as is the one recommended by the writer of the paper (see drawing).

●

## Heat Transmission by Radiators

**From "Die Waermeabgabe von Gliederheizkoerpern", by E. Schmidt and H. Krausshold; Gesundheits-Ingenieur, Berlin; Nos. 5, 6, 7, January and February, 1932; 14,000 words.**

**ABSTRACTED BY A. A. BERESTNEFF**

Gives the results of investigations made at the Laboratory of Technology, in Danzig. The authors used the test arrangement shown in Fig. 1. They claim this arrangement to be better than the method in which the condensate is weighed to determine heat transmission, because the supplied heat is measured electrically and, therefore, more accurately. The small amount of heating medium (steam or hot water) permits quick heating. If equipped with thermocouples the room need not be entered during the test and the radiator is not subjected to disturbing air motion.

The heat transmission coefficient is computed by the formula

$$U = \frac{3.415\ VI - h_1}{A\ (t_1 - t_2)}$$

in which:

- $U$ = heat transmitted in B.t.u. per hour per square foot of surface, per degree F. of temperature difference.
- $V$ = voltage
- $I$ = current in amperes
- $h_1$ = heat losses in B.t.u. per hour
- $A$ = radiator surface in square feet
- $t_1$ = temperature of heating element in °F.
- $t_2$ = temperature of room, in °F. (measured at a point 8 ft. distant from the radiator, and shielded against radiation).

For the determination of the heat losses of the apparatus the pipes *b* and *d* of Fig. 1 are connected by a short well-insulated pipe, and the heat input is measured when maintaining a temperature on the surface of the pipe insulation of *b* and *d* the same as used during testing. The authors claim an accuracy of within plus or minus 0.5% in the determination of U by this method.

Forty different types of radiators were tested, the majority being of the usual style, and several with a

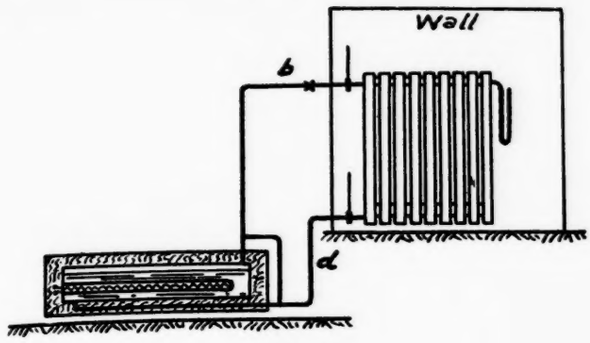


Fig. 1

projected area, which will be discussed later. Most of the radiators were painted with gray lacquer. For the unpainted radiators the measured value of U was found to be lower by 4%. Therefore, for comparison the corresponding values of U for unpainted radiators were increased by 4%. It was found further that the barometric pressure influences only the heat transmission by convection, the former being proportional to the square root of the barometric pressure. The radiation part equals about 30% (between 23% and 33%) of the total if the radiator is surrounded by free air (no wall near the radiator). In the case of a wall on one side, the radiation part is reduced to 17.5%. The temperature difference between the heating medium and the room influences the value of U considerably. According to the German "rules" the room temperature should be 68° F., and the temperature difference 144° where steam is used, and 108° for hot water, the temperature of the hot water inlet being 194° and the outlet 158°. The convection part of heat transmission was found to be approximately proportional to the 0.25 power of the temperature difference. The radiation part is known to be proportional to the difference of the fourth powers of the absolute temperatures of the radiator surface and the air. The relation between Q, which is the total heat given off, the barometric pressure, and the temperature difference, for values of the latter between 104° and 212°, can be expressed by the equation:

$$Q = Q_n \left[ s + (1-s) \sqrt{\frac{P}{P_n}} \right] \times \left( \frac{t_r - t_a}{t_r^1 - t_a^1} \right)^{4/3}$$

in which:

$Q_n$ = heat transmission at normal barometric pressure in B.t.u. per hour.
$P$ = given barometric pressure, mm. Hg.
$P_n$ = normal barometric pressure (760 mm. Hg.)
$s$ = heat transmitted by radiation, assumed = 0.20.
$(t_r - t_a)$ = normal temperature difference between radiator surface and air, in °F.
$(t_r^1 - t_a^1)$ = actual temperature difference between radiator surface and air, in °F.

Heat transmission coefficients are calculated for 14.7 lb. per sq. in. barometric pressure, a temperature difference for steam at 144°, and for hot water at 108°, measured with the radiators located 2.36 in. from a wall and painted with lacquer (or corrected as indicated).

The factors influencing the value of U are:

1. *Location.* The maximum value of U is reached when the radiator is located free inside the room. If located near the wall the value of U is reduced by 2%.
2. *Material and surface.* There is no difference between cast iron and malleable iron when the radiators are similarly painted and of the same shape.
3. *Number of sections.* With increasing number of sections the value of U decreases. The writers recommend this formula for computing U:

$$U = \frac{U_e + (n-1)\, U_m}{n}$$

in which:

$U_e$ = coefficient of heat transmission for one single item.
$U_m$ = same coefficient for a section located between two other sections.
$n$ = number of sections.

The results as computed coincide well with the direct measured values.

4. *Distance between the sections.* With increasing distance the heat transmission increases.
5. *Height of sections.* With increasing height the convection part of the heat transmitted decreases.
6. *Depth of sections and number of columns.* For the same height of radiators, U decreases with increasing depth of sections. The tests show that it is better to enlarge the heating surface by corresponding enlargement of the depth, than by increase of the number of columns.

The last part of the paper is devoted to a mathematical analysis of a special design of radiators, having projections on both sides, as shown in Fig. 2. These projections are similar to the extended surfaces of a fin tube. After some theoretical considerations, the writers arrive at the conclusion that the total heat given off by the projection on our side of the section is proportional to the temperature at the surface, adjacent to the tube, and the height of the tube, expressed in an equation which takes into account the difference in temperature existing in the projection adjacent to the tube and at its outer edge.

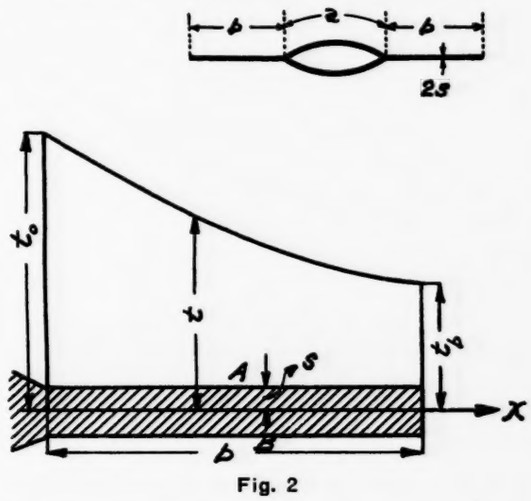


Fig. 2

A table has been compiled from these mathematical considerations and is included in the original paper, by means of which it is possible, knowing the physical properties of the fin material, to determine the size of fin required to obtain a maximum heating effect per unit weight of radiator.

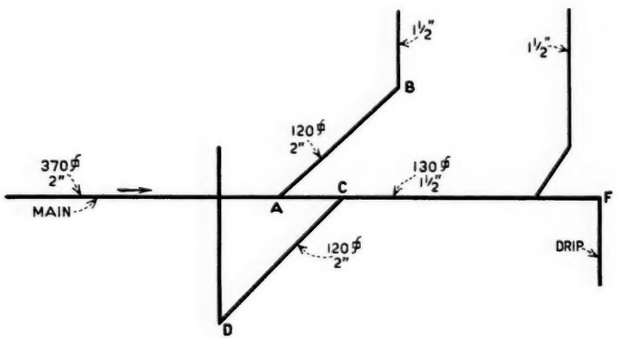
# Your Everyday Problems

**Mr. Hanburger will be glad to answer your problems relating to installation and operation of heating and ventilating systems, and wherever possible will give the reasons for his suggestions. Letters will be answered direct to the inquirer and in some cases published anonymously. If sketches are included they should be clearly drawn. Write Mr. Hanburger, HEATING AND VENTILATING, 148 Lafayette Street, New York.**

## Conducted by FRED W. HANBURGER

*QUESTION 44. I am installing a steam heating system that was designed by a prominent engineer in our city. He has a 2 in. main feeding two 2 in. and one 1½ in. branches and insists that it be put in as shown. I am only a practical man, but it looks wrong and unnecessary to me. Enclosed is a sketch of the layout.*

*M. C.*




ANSWER. The lay-out is very good. In the main the condensation is flowing with the steam and a small pipe may be used, which is also the case from C to F. From A to B and from C to D, however, the condensation is returning against the steam flow and it calls for a larger pipe. If the pipe sizes here were made smaller the flow of steam would be so great as to sweep the water with it and cause water hammer. In the vertical riser a greater steam velocity may be used without bad results and the engineer has reduced it accordingly. This is the reason for the old rule-of-thumb that the branches should be one size larger than the riser. In general, the flow in the branches should not exceed 23 ft. per sec., and they should have a pitch of 1 in. in 5 ft.

●

*QUESTION 45. I have been called to account several times where I have given an estimate of the probable tonnage of coal required per season for the heating systems which I have installed. Is there a safe method of estimating this?*

*C. S.*

ANSWER. The degree day method is no doubt the safest, but you should remember that in predicting this you are predicting the weather conditions. Recently, Dr. James H. Scarr, of the New York Weather Bureau, stated that the temperature averages the same, and very closely so, when taken in periods of five years. In any one of those five-year periods, however, we may easily have one very cold winter and one mild one.

A short quick rule which may be of service to you may be developed thus:

In general, it will be found that a season's firing period is equal approximately to 2200 hr. of maximum operation. By multiplying the number of pounds of coal that will be burned during the coldest, or design, hour, by 1.10 will give the number of tons burned per season.

The number of pounds of coal burned per maximum hour can be expressed as the number of square feet of radiation which will be supplied by 1 lb. of coal for a maximum hour. With 8000 B.t.u. effective heat from 1 lb., and each square foot of radiation requiring 250 B.t.u. per hr., 1 lb. of coal will supply 32 sq. ft. of radiation for the maximum hour. For a building with 1000 sq. ft. of radiation, then we would have

$$1.10 \times \frac{1000}{32}$$

or 34 tons of coal per season.

●

*QUESTION 46. I have an installation where a large boiler and a small cast water heater are connected to the same chimney. The boiler heats 15 apartments, a dance hall, and eight stores, the total load approximating 6000 sq. ft. of cast iron radiation. The water heater has a grate area of 3.68 sq. ft. The chimney is 24 in. x 30 in. and 85 ft. high.*

*The system worked all right in the winter, but when the water heater is run alone, the chimney is too large. If I continue the 10 in. flue from the water heater up through the large chimney, how high should it be?*

ANSWER. The United States Treasury Department rules for chimneys are so practical and easy to remember that they are worth noting. For steel boilers the rule is

$$A = \frac{G}{\sqrt{H}},$$

and for cast iron boilers

$$A = .75\,\frac{G}{\sqrt{H}},$$

where A is the cross-sectional area of the chimney in square feet, G is the grate area in square feet, and H is the height of the chimney in feet. In my opinion,

however, the first rule applies equally well to all boilers.

For a 10 in. flue and a steel boiler with a grate area of 3.68 sq. ft., we find that the height of the chimney should be

$$\sqrt{H} = \frac{G}{A} \text{ or}$$

$$\sqrt{H} = \frac{3.68}{.545} = 6.75$$

$$H = 45.6 \text{ ft.}$$

It appears, however, that a 26 in. water heater is rather small for 15 apartments and eight stores, and that the capacity might be advantageously increased by extending the flue the full height of the chimney, creating a stronger draft, and making it possible to burn more fuel. I believe that the peak water load for the apartments themselves would call for the full capacity of a 26 in. heater.

●

*QUESTION 47. I understand that it is an established fact that an open gas flame burning with complete combustion in a room, consuming a definite amount of gas, must evolve a definite amount of heat. Now, why will this same burner, if surrounded by a casing (as is a gas stove, or where used in connection with a gas steam radiator) burning exactly the same amount of gas and evolving the same amount of heat, heat the room so much warmer than with the open burner? There has been no heat lost. We may say that it is more evenly distributed, but that would have to mean a concentration of heat somewhere. Where is it?*

*B. H. J.*

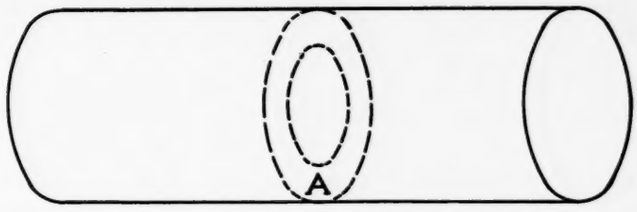
ANSWER. A discussion of this kind, particularly on such an interesting point, is always of benefit and this column is cheerfully held open for the opinions of the readers. Sometimes we glean the greatest information from an opinion even though the premise is wrong. Answers will be published in this column for our mutual benefit.

●

*QUESTION 48. We are being called on to do more and more air conditioning work, involving considerable ductwork. I notice that in the design of such installations, air dampers are called for to regulate the air supply. It occurs to me that when the damper is partly closed the air velocity must be high, creating a high friction. Could not this friction be built up by using a smaller duct?*

ANSWER. An ideal system would be one in which all the ducts are sized so that exactly the proper amount of air would flow to its outlet without the use of damper regulation. Strange as it may seem, however, this could not be accomplished without increasing the velocity far beyond that flowing through the damper unless the main ducts were made excessively large at the expense of space and money.

Any little projection in a duct creates a far greater




disturbance than is commonly supposed, and in most cases very much more than the wall friction. While the laws governing the value of different resistances vary with the different authorities, yet in all cases we can take the resistances created by an orifice as 2.5 to 3.0 times the velocity head. One value often used is 2.78.

Referring to a friction chart on air flow it will be found that it takes from 40 to 60 times the duct diameter to create a friction equal to the velocity head itself. Possibly this can be better shown with a numerical example.

The sketch shows a 24 in. diameter duct with an orifice plate shown at A to take the place of the damper. Assuming a velocity of 1200 f.p.m. and referring to a friction pressure loss chart it will be found that the loss through this duct is 0.0009 in. of water per foot of length. The velocity head for 1200 f.p.m. (20 ft. per sec.) is

$$H = \frac{20^2}{2g} = 6.25 \text{ ft. of air}$$

or 0.09 in. of water.

It will be noticed that it would take 100 lin. ft. of this pipe to create a friction pressure loss equal to the velocity head.

Now, let us suppose that we desire to create a friction pressure loss of 0.36 in., four times the original loss. It would be necessary with a 100 ft. duct, to double the velocity, making it 2400 f.p.m. By means of the orifice plate we can leave the duct as it is, and by increasing only slightly the velocity through the orifice, create the same amount of friction.

The friction loss with an orifice, as stated previously, is 2.78 times the velocity head. To obtain a friction loss of 0.36 in. with an orifice we must have a velocity head of

$$\frac{0.36}{2.78} = 0.13 \text{ in. of water, equivalent to 24 ft. per sec., or 1440 f.p.m.,}$$

an increase of about 1/6 the original velocity.

This brings forcibly to mind the trouble that may be caused by any protruding objects in ducts, or unreamed pipe joints in steam or hot water systems. Many a steam heating installation must operate on several pounds of pressure where but a few ounces should suffice.

An orifice plate was used as an illustration as it would be difficult to estimate the resistance through the damper opening, which would naturally vary for different settings, and in all cases would create greater disturbance or friction loss than the plain orifice.

Again, since the dampers lend themselves so readily to creating friction, they may be the means of ruining the functioning of a system if they are accessible to all the tenants of a building instead of only the engineer in charge.

# News of the Month

### A. G. A. to Limit Exhibition to Certain Appliances

Although announcement has been made that the American Gas Association has abandoned its plans for an exhibition in connection with its convention, it now appears possible that a partial exhibition, covering office appliances, may be held at that time.

The convention will be held in Atlantic City, October 10-14, as originally scheduled.

### Building Owners and Managers to Meet June 6

Samuel G. Neiler, Chicago, Ill., will discuss air conditioning in a paper to be presented before the twenty-fifth annual convention of the National Association of Building Owners and Managers, to be held June 6-10 at the Drake Hotel, Chicago. L. K. Ferris, Detroit, Mich., will address the convention on the subject "Lower Operating Costs Through Heating Efficiency."

### Home Loan Bill Favorably Reported

A favorable report was ordered May 20 by the House Committee on Banking and Currency on the Luce Bill, (H. R. 7620) which provides for the establishment and administration of from eight to twelve home loan banks, capitalized for $125,000,000, for the purpose of rendering financial support to home building. Representative Robert Luce of Massachusetts, author of the bill, believes that its enactment would prove the best of all business relief measures proposed to date, since its benefits would be so far reaching.

## Merchandising Prominently Featured at Contractors' Convention

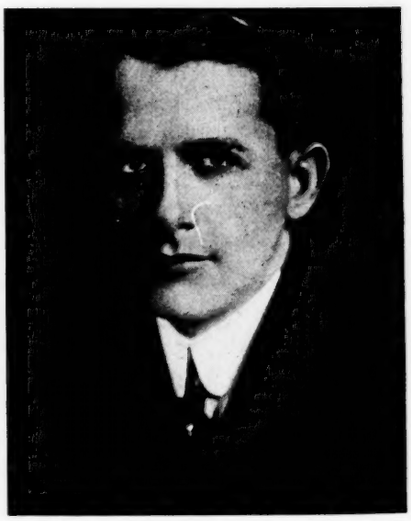
Business conditions and the selling aspect of the industry were particularly emphasized in papers presented before the forty-third annual convention of the Heating and Piping Contractors National Association, held in Detroit, Mich., May 16-18. Air conditioning, Certified Heating, pipe welding, and qualification of contractors also had prominent places in the discussions.

Delegates were welcomed to Detroit by the Honorable Frank Murphy, mayor of the city, and by George Freyn, chairman of the convention committee.

Following this, the address of Ray L. Spitzley, president of the association was received. Mr. Spitzley said that the nation stands at present at the crossroads of a revival. The attention of the delegates was directed to the accomplishments of the association, made in the face of the adverse circumstances under which the industry has been working.

Contractors in the industry are urged to take every advantage of the opportunities offered in the modernization field. This type of work, said Mr. Spitzley, supplements to a great extent the lack of new building projects, and has proven not only profitable, but has opened up new contacts with the public, and strengthened the good will enjoyed in connection with old customer contacts. Money spent in construction work reaches more people than that spent in any other direction. The development of air conditioning, and the standardization of welding in all its phases relating to heating and piping is essentially the heating engineer's problem, according to the speaker.

Mr. Spitzley vigorously condemned the practice of taking work without profit as being not only injurious to the contractor, but also constituting a menace to the entire industry. He spoke in favor of the pending legislation providing for the separation of contracts. He also urged a concerted effort on the part of the association and its members in a drive to gain new members.



**Newly-elected officers of Heating and Piping Contractors National Association. Left to right—Robert D. Williams, president; J. Lawrence DeNeille, vice-president; John H. Zink, treasurer.**

Joseph C. Fitts, secretary of the association, read the report of the national headquarters, in which he told that curtailment of staff and cuts in salaries had been necessary. He spoke of the advantages to be gained by continuing the association's activities at full strength during the depression. He also expressed the opinion that the day had come when the contractor must become essentially a salesman if he is to succeed.

S. Lewis Land, in reporting for the educational department, disclosed that the work of that department in sales promotion had resulted in $1,500,000 of work last year that otherwise would not have been obtained. Much of the educational work consists in organizing welding classes. Research and information service are also functions of this department.

J. L. DeNeille, chairman, presented the report for the membership committee. He announced that the membership work has been reorganized and that 2300 prospects have been listed.

At this point, the president introduced Col. James L. Walsh, vice-president, Guardian Detroit Union Group, who delivered an address on "The Outlook for Business." Mr. Walsh, who recently returned from Washington, where he conferred with leaders of both political parties, said, "The situation in Washington shows a distinct trend towards facing the facts and taking constructive steps which will tend to hasten recovery." Among the encouraging signs noted by the speaker were the determined effort to balance the national budget, an increasing appreciation of the need for passing a sound legislative measure which will distribute the burden of taxation equitably, the strong movement to consolidate bureaus and in other ways to curtail the expense of government, and the fact that the consensus of informed opinion is in favor of the Glass banking bill, which seeks to make the safety of the depositors' funds the primary consideration.

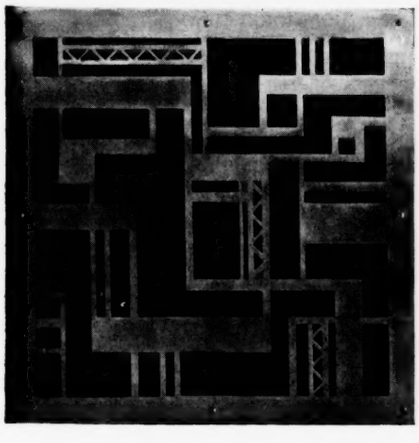
Mr. Walsh pointed out that such influences as railroad development, automobile production, and a nation-wide demand for radios have supplied the impetus which resulted in ending previous depressions, and suggested that an increased use of air conditioning equipment may prove to be the factor that will overcome the present business inactivity.

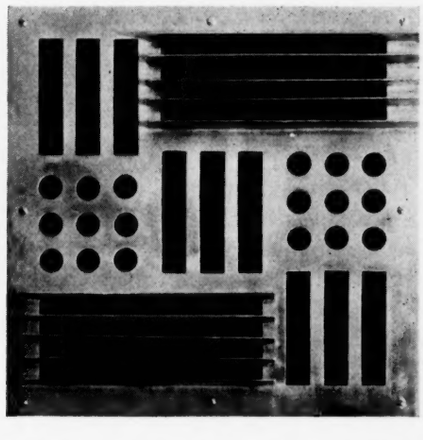
Tuesday morning was largely devoted to the reading of papers by members of the Association Managers' and Secretaries' conference. The first of these was "Keeping Abreast of the Times," by Louis T. Braun, secretary, Chicago Master Steamfitters' Association. Mr. Braun spoke of the several major changes taking place in the heating, ventilating and air conditioning industry. He pointed out that the refrigeration and heating fields have now merged and in some cases overlap, and that the heating contractor must now be prepared to handle refrigeration as well as heating.

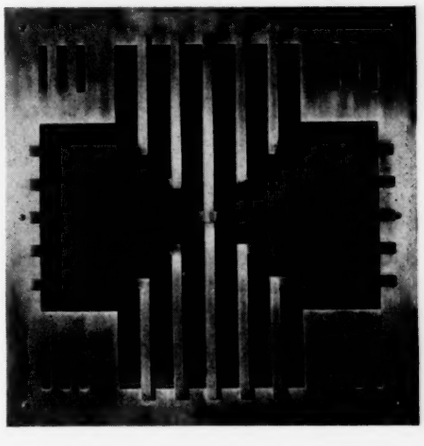
Harry Geiser, secretary, North Jersey Association, was the next speaker, and his subject was "Organizing a Pipe Welding Training Class." In opening his discourse, Mr. Geiser declared that experience has pointed to the fact that mechanics who may be qualified as welders, but who are unfamiliar with steam heating and power piping, are altogether unsatisfactory, and stated that welding is just one more tool to be adopted by the fitter. Mr. Geiser advocated a cooperative arrangement with the vocational school authorities, working with a joint committee composed of representatives of the employers and journeymen, as the best means of training fitters in the new process of pipe welding.

A paper entitled "Prequalification of Bidders" was presented by Robert B. Miller, secretary, New York City Association. Mr. Miller urged enactment of prequalification laws by the various state legislatures to curb the irresponsible contractor who has little experience, no established place of business, and no financial standing.

A report of the committee on standards, in which the work of that group for the year was reviewed, was next submitted by Richard A. Wolff, chairman. He announced their expectation to have tables on hot water pipe sizing available in the near future. He also described the work conducted by the committee in which exposure factors for air in six additional cities were studied. Experiments have been conducted at New York University during the past winter, according to the speaker, in which the effect of wind velocity on heat demand was investigated. The mild winter interfered with this work,







**Grilles of cut-out sheet monel metal with applied bars and fins used in the Eaton Store, Toronto, Canada. According to the "American Architect", this type of craftsmanship will supplant much of the heavy cast work of recent years.**

but it is expected that it will be continued next year.

Walter L. Fleisher, consulting and advisory engineer of New York, spoke on "Air Conditioning." He pointed out that the heating contractor is confronted today with the necessity for incorporating air conditioning into his work, or going out of business, so closely is this class of building equipment tied up with his regular work. He also stressed the desirability of the contractor familiarizing himself with the technical principles of air conditioning, so that he can competently specify and execute installations.

Mr. Fleisher favors humidifying at a centralized point, rather than unit humidifiers at local points. He pointed out that a steam or hot water installation, with a humidifying device in the basement, is a strong competitor of the warm-air installations for domestic heating. He also advocates steam cooling installations as presenting great possibilities for space cooling.

Harry M. Hart proposed a resolution, which carried, making R. S. Franklin and Walter L. Fleisher honorary members of the association in recognition of their work as heads of the standards committee, neither of these men being contractors.

In the absence of C. P. Finke, chairman of the committee on Certified Heating, his report was read from the floor. It disclosed that some attempt had been made to allow suburban and isolated contractors to use Certified Heating when no city association is in the vicinity.

A report of the committee on welding, presented by John H. Zink, chairman, constituted the last paper to be read at the Tuesday morning session. He told the delegates that the committee had been cooperating with the Federal Board for Vocational Education in training journeymen welders, and that there are at present some half-dozen classes in existence. His committee is attempting to foster the idea that welding should be regarded as a tool and a process, and not as a separate trade.

A report of the committee on separation of contracts, Robert D. Williams, chairman, started the business of the Tuesday afternoon session. Walter Klie, chairman, committee on trade promotion, next presented the report for that committee, in which he outlined the year's work, and described the sales promotion plan instituted by the association. Following this, the Third Annual Survey of the Heating Industry, was read by Joseph C. Fitts.

An address, "Ask Them to Buy!" by William S. Power, Campbell-Ewald Co., Detroit, Mich., completed the session. He cited the three primary necessities for success in business to be an adequate market, something to sell that the consumer needs, and the ability to sell it. It was pointed out that the market for new construction is not hopeful at present, but that the home remodeling and modernizing market is bigger and more promising than it has ever been before.

Salesmanship is all that is needed to exploit the market that is waiting, in the speaker's opinion. He condemns the old-time high-pressure salesman, and said that the successful seller of today must be a diplomat and an engineer.

On Wednesday morning, the final business session was held. At this gathering, the reports of the convention committees were read, and new and unfinished business transacted.

Robert D. Williams, vice-president of Baker Smith & Co., New York, was elected president for the coming year. Other newly-elected officers are: vice-president, J. Lawrence DeNeille, secretary and treasurer, Eichler Heating Co., St. Louis, Mo.; secretary, Joseph C. Fitts, the present incumbent; treasurer, John H. Zink, president, Heat and Power Corp., Baltimore, Md. Ray L. Spitzley, the retiring president of the association, and Mr. DeNeille were elected to the board of directors. Other new directors appointed at the convention are: Justin A. Kiesling, president, Robischung Kiesling Co., Houston, Tex., and Thomas O'Callaghan, Acme Heating and Ventilating Co., Boston, Mass.

## Research and Merchandising Are Stressed at Warm Air Heating Convention

About 180 delegates registered at the National Warm Air Heating Association convention, held at the Deshler-Wallick Hotel, Columbus, Ohio, May 18-19. Problems of the industry, both merchandising and technical, were ably presented and discussed by a number of speakers. I. L. Jones, president of the association, was ill and unable to attend, and the chair was occupied by W. L. McGrath, second vice-president.

The first speaker on the program for the Wednesday morning session was A. W. Wrieden, Holland Mich., whose subject was "The Present Problems and Future Opportunities of Our Industry." Mr. Wrieden condemned the practice of price-cutting, and called attention to the folly of over-extension of credit. He strongly advocated support of association activities at present, and expressed a belief that the future lies in air conditioning. The association has real engineering information on the subject, according to the speaker, and should assert itself as to the true source of such knowledge. Mr. Wrieden expressed the hope that funds would soon be available whereby publicity activities might be carried on.

L. B. Murphy, Cincinnati, Ohio, followed with a discussion on "Credits—Manufacturer and Heating Contractor," in which he proposed the use of standard forms of procedure for both manufacturers and dealers. He had drawn up such a form, and presented it for inspection and criticism, in order that a satisfactory standard might eventually be worked out.

W. L. Raybolt, Ashland, Ohio, spoke on "Costs and Selling Expenses for the Manufacturer and Dealer." He pointed out the advisability of exercising a close control over both during the period of reduced business activity.

Monday afternoon was devoted to technical papers. F. J. Sedgwick, chairman, research advisory commit-

tee, presided. The first speaker was Prof. A. C. Willard, head of the department of mechanical engineering, University of Illinois, who described with the aid of lantern slides the most recent installation of apparatus in the research residence, consisting of a fan-driven warm-air heating system. He showed how various combinations could be obtained for special investigations.

S. Konzo, special research assistant, followed Professor Willard with a report on some of the test results obtained during the past few months. His slides illustrated how adjustment of the ducts had affected the "balance" of the system. By the use of dampers, it was found possible to obtain uniform air temperatures in the various rooms. He also described the results obtained when the system was operated by gravity, by intermittent fan operation, and by steady fan operation. Steady forced operation produced lower delivery air temperature, used slightly less fuel, but consumed considerably more power.

Three methods of effecting operating control were reported, and charts and graphs illustrated how these methods compared. Mr. Konzo explained the action of each in detail.

A. P. Kratz, research professor of mechanical engineering, University of Illinois, concluded the work of the Wednesday afternoon session with a description of the investigations on pressures, velocities and air filters. He showed the methods used in estimating the static pressure at the fan, and presented curves showing that the actual measured pressure obtained after the system was in operation very closely approximated the estimated head. He pointed out that this value depends not only upon the drop in pressure across the fan and furnace, but also upon the drop through the ductwork, and that this would depend upon the characteristics of the particular system.

Professor Kratz also presented data obtained from tests made with several kinds of filter, both clean and loaded with dirt, and included curves showing how these filters affect the frictional resistance to air flow and the amount of power required to drive the fan.

Velocities as high as 1000 f.p.m. were recorded in the ducts, and the tests indicated that a velocity of 750 f.p.m. is perfectly satisfactory for residential work. He had found outlet velocities as high as 500 f.p.m. at the registers, and since no disagreeable effects were noted, he concluded that average velocities of 300 to 400 f.p.m. are suitable.

**Willard S. Karn**

**Eastern sales manager and director of May Oil Burner Corporation, nationally known bridge player, and rated as America's No. 1 player by Shephard Barclay.**

H. T. Richardson, Jr., presided over the Thursday morning session, and the first speaker introduced was L. C. Murphy, Louisville, Ky., who spoke on "Air Pollution and Its Relation to Community Health." He outlined the problems arising from dust carried in air, and included a summary of results of a recent survey of the conditions in a number of cities. The speaker told of the progress that has been made in the control of air pollution, and described the improvements made in experimental apparatus. Experiments to investigate the elimination of pollen from the air were also explained, and examples of recent dust filtering equipment were shown.

Prof. R. B. Leckie, Purdue University, followed with a brief discussion of the use of gas as a house-heating fuel. He touched on the subjects of heating value and its importance, and the significant increase in natural gas. It was recommended that the manufacturers of house-heating boilers and furnaces so design their products that they will be readily adaptable to the use of gas as fuel.

# News of the Month

A note of optimism was introduced into the meeting by Dean F. Paul Anderson, University of Kentucky, who presented an address entitled "Keeping Cool." He predicted an early return of good times, and said that the warm-air heating industry promises to benefit accordingly.

An account of dealers' experiences in selling warm-air heating, and submission of reports by the various committees, completed the business of the convention.

## Kohn Believes Manufacturers Might Finance Large Scale Housing

At a conference, called by the housing section of the Welfare Council and the Housing Association of the City of New York, held March 13, builders, architects, financiers, and housing experts discussed the possibility of launching a program of large scale housing construction projects throughout the country. Both the economic and the philanthropic advantages of such a step were brought forth at the meeting.

Belief was expressed by Robert D. Kohn, president of the American Institute of Architects, that manufacturers of building materials, who are now suffering from the curtailment of building operations, might themselves finance such operations. The necessity for considering large scale housing from a business, and not a philanthropic, viewpoint was stressed by Alfred K. Stern, chairman of the committee on large scale operations of President Hoover's conference on home building and ownership. He said that such buildings, designed to provide workers with pleasant homes at low rentals, offered a promising field for investment, when properly conceived and executed.

## Welding Society Addressed on Pipe Welding

At the Friday morning session of the annual meeting of the American Welding Society, held in New York, April 27-29, W. P. Curley, New York district manager for Tube

Turns, Incorporated, presented a paper entitled "New Aspects in Pipe Welding," in which he traced the development of pipe welding from its introduction up to the present time.

Mr. Curley said that progress in the use of welded pipe in the low pressure heating field had been confined largely to enterprising contractors, and that the tremendous decrease in construction of a private or semi-private nature had seriously handicapped these organizations. A more general application of welded pipe to public works construction, which now predominates the building activity, has been delayed to some extent due to the desire on the part of governmental agencies to avoid limitations in specifications. Welded pipe is quite generally used in the distributing systems of district steam plants, and valves, slip type expansion joints, and other fittings, designed especially for welding, have made possible 100% welded jobs in this application. It was pointed out by the speaker that refrigeration piping requires the identical characteristics which welding provides, and that a wider application in this field should be sought.

New pipe standards must be created to conform to the conditions of welding practice, according to Mr. Curley. This will necessitate a revision of standards in regard to gauge of pipe required, as well as a change in design of fittings. Reduction of weight, decrease in frictional resistance to flow, ease of compensating for expansion, reduced insulation costs, and reduction of maintenance costs were cited as advantages in favor of pipe welding.

A description of the piping system in the recently completed Burlington generating station of the Public Service Electric & Gas Company of New Jersey formed the basis of a discussion on "Pipe Welding for a High Pressure Steam Power Plant," by E. B. Severs and W. P. Gavit, presented at the same session.

The equipment in this plant operates at a pressure of 730 lb. per sq. in., and a temperature of 860° F. Joints were welded throughout, with the exception of connections to turbines, boilers, and at valves. The paper contained a detailed description of the methods used in making the welds and in annealing the joints.

## *Jen Ral Kont Rakter Gets the Bum's Rush*

***By Ab El Pilauf***

**THE Caliph of Bagdad would build himself a palace. When the Lord High Architect spread forth the plans, the Caliph praised him to Mahomet, and called into his presence his artificers in stone and bronze, who groveled before him, awaiting his commands in fear and trembling.**

**Just as the Caliph was about to impose his royal will upon these less than dirt beneath his feet, there was commotion and outcry at the portal, and a haughty and important individual strode through the prostrate throng.**

**Without salaaming before the Caliph, as did the faithful, he drew his burnoose about him and spoke.**

**"Mahomet's eldest son desires a palace? It is well. Have naught to do with these chiselers and tinkers. Let me handle them, and I will cause them to climb trees and bark like foxes, that thy edifice may be nobly built."**

**"And," he added, leaning closer and winking confidentially, "I will stand between these scum and thy exchequer, that they may gyp thee not."**

**"And who art thou, that canst perform this miracle?" asked the Caliph, eagerly.**

**"I am the manservant of Allah, known to all these unrighteous as Jen Ral Kont Rakter.**

**"Jen, old kid," said the Caliph, gleefully, "sit thou at my right hand and build me my igloo to the music of the cracking of their bones."**

**Then the Caliph went fishing, and Jen Ral cracked his whip.**

### Anthracite Club Speaker Discusses Merchandising

At a meeting held at the McAlpin Hotel, May 11, J. W. Daniels, advertising manager of the Hudson Coal Co., Scranton, Pa., addressed the Anthracite Club of New York on the subject of merchandising. Mr. Daniels emphasized the necessity for coordination of efforts by the production, distribution, and retail branches of the industry.

He advocated advertising as the best of modern business tools for actively stimulating patronage, and urged that the dealer not forget the value of his offices, yards, trucks, and salesmen as advertising media. As a procedure to be adopted in improving business, Mr. Daniels recommended that the dealer "put his house in order" with regard to the condition of his yard, offices, and trucks, bring his card files up to date, and instruct his sales force in an effort to improve its methods.

In the discussion that followed, Oscar F. Ostby, president of the club, brought out the importance of differentiating between anthracite and bituminous coal, and of mentioning the improvements in the quality of anthracite in late years when talking to customers, many of whom are not familiar with its advantages. Another point discussed was the lack of effort on the part of anthracite dealers to bring anthracite-

burning equipment to the attention of the consumers, as has been done by the utility companies with gas and electrical appliances.

As a result of the elections that were unanimously carried at the meeting, Mr. Ostby will continue as president of the club for another year, and M. C. Peters and T. S. Trimmer will serve as vice-presidents. The office of secretary and treasurer has been combined, E. H. Westnage being elected to this post.

**When the palace was finished, the floors warped, the windows rattled, the roof leaked, and the braziers were too small to give off comforting heat, and the Caliph suffered much from goose pimples.**

**When Jen Ral came to collect his retained percentage, the Caliph said, between sniffles from his dripping proboscis, "Thou dog of a deceiver! Thou shalt tear this shanty down with thy teeth. Then, because thy work smells to heaven, I shall cut off thy nose. And because thou hast filled me with thy hooey, I shall cut off thine ears. Then thou shalt be chased into the desert, and may the jackals gnaw thy carcass."**

**The Caliph then summoned the artificers again, and said, "Henceforth, the Lord High Chancellor shall see that each of you shall toil on my palace as thou knowest best how to do. He shall arbitrate thy squabbles, and pay thee well for thy work. Hasten, therefore, to thy tasks, and get thee busy."**

**And the palace was built as it should have been, before Jen Ral horned into the picture.**

**And the jackals who met him in the desert, sniffed at him and said, "Thou art too tough" and they abolished him not.**

**And so, instead of becoming extinct, as the Caliph intended, he wanders through the world and woe follows in his wake, yea, down even to our day.**

## Bond Issue for Building Program Proposed to Senate

A plan for an emergency relief measure, laid before the Senate on May 11 by Senator J. T. Robinson of Arkansas, includes the issuance of tax-exempt bonds, amounting to $2,000,000,000 to finance a construction program of self-liquidating and profit-making enterprises. Such construction would include bridges, tunnels, and improvements in the slum districts in large cities. Simultaneously with the issue of these bonds a special tax should be raised to pay the interest and amortization, and thus relieve the national budget of additional burden.

Benefits to be derived from this method of increasing the buying power are not limited to the sums actually spent in wages, but extend to the revival of business by the sale of materials and supplies. In addition, improved living conditions could be achieved by apportioning a part of the funds to new construction in tenement and slum districts, where rent of structures could be lowered from the present charges, and yet be sufficient to meet the interest and sinking fund requirements of the venture.

In a prepared statement, dated May 17, Senator W. F. George of Delaware declared the measure to be unsound. He questions the Government's ability to judge which enterprises are self-liquidating, and which are not, and expresses an opinion that such financing is the function of the banks of the country, fortified as they have been with public funds through the Reconstruction Finance Corporation. Senator George further states that the imperative need at present is a substantial reduction in the cost of government, and that the proposed authorization is a "mere poultice applied to the surface" and postpones, if it does not defeat, fundamental remedies.

## President Hoover Again Endorses Home Loan Banks

Support for the idea of a system of home loan banks is again given by President Herbert Hoover in the first signed article prepared by him for any periodical since his inauguration. The article appeared in the June issue of *Ladies' Home Journal*.

It is pointed out in the article that whereas nearly any other desirable possession can be purchased on the basis of 25% in cash, and the balance secured on the property, and somewhat on the character of the purchaser, no such credit is extended the family working to purchase its home. The President states:

"To advance the whole finance of homes, whether they be in towns or on farms, I proposed to the Congress a measure to set up a Federal system of Home Mortgage Discount Banks, to which may belong building and loan associations, savings banks, deposit banks, farm loan banks, etc.

"The broad purpose is to provide for the homeowner a comparable background of stable credit with that we have already provided nationally for the business man

through the Federal Reserve Banks and for the farmer through the Farm Loan Banks and the Intermediate Credit Banks. The plan and method is not to engage the new institutions in the business of providing direct loans but to give impulse, security and safety, and lower interest rates to the already existing institutions, especially the mutual institutions, in order that they may extend the fullest measure of credit to would-be homeowners."

## A.S.H.V.E. Semi-Annual Convention at Milwaukee Promises Full Program

Revision of the constitution and by-laws, a report of the committee on ventilation standards, and the presentation of a number of technical papers should provide a busy and interesting program for the members of the American Society of Heating and Ventilating Engineers, who gather June 27-29 at the Hotel Pfister, Milwaukee, Wis., for the semi-annual convention. The papers selected by the program committee embrace a wide range of subjects, and give the results of data collected at the society's research laboratory and the several cooperating institutions.

A varied program of entertainment features has been arranged for the hours not devoted to business and technical sessions, and entertainment provisions for the women guests have been given careful consideration. On Monday, at noon, the women will leave for luncheon and bridge at the Milwaukee Yacht Club. Monday afternoon will be devoted to golf for the men, and the evening will be occupied with dancing. Informal golf, or other sports for the men in the afternoon, and an automobile trip and an inspection visit for the women, will be enjoyed on Tuesday. On Tuesday evening, the semi-annual banquet and dance will be held in the Fern Room, Hotel Pfister.

Following is the program in part:

**June 27**

8:30 a.m.—Registration.
Velocity Characteristics of Hoods Under Suction, by J. M. Dallavalle.
Natural Wind Velocity Gradients Near a Wall, by J. L. Blackshaw and F. C. Houghten.
Report of Committee on Revision of Constitution and By-Laws, by W. T. Jones, chairman.

**June 28**

9:30 a.m.—Report of Technical Advisory Committee on Re-Study of Comfort Chart and Comfort Line, by C. P. Yaglou, chairman.
Carbon Monoxide Distribution in Relation to Garage Ventilation, by F. C. Houghten and Paul McDermott.
Investigation of Air Outlets in Classroom Ventilation, by G. L. Larson, D. W. Nelson, and R. W. Kubasta.
Report of the Committee on Ventilation Standards, by W. H. Driscoll, chairman.

**June 29**

9:30 a.m.—Report of Chapter Relations Committee, by E. K. Campbell, chairman.
Thermal Properties of Building Materials, by F. B. Rowley and A. B. Algren.
Tests of Convector Heaters in the Warm Wall Booth, by M. K. Fahnestock and E. L. Broderick.
Loss of Head in Copper Pipe and Fittings, by F. E. Giesecke and W. H. Badgett.
Automatic Gas Burners, by C. George Segeler.

## Third B & O Train Air Conditioned

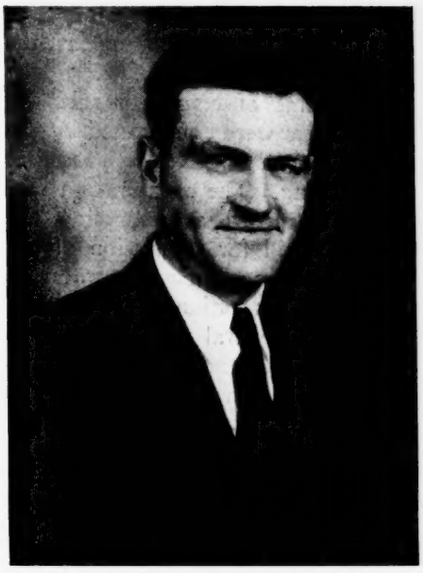
Another of the Baltimore & Ohio's trains, the *Capitol Limited*, operating between New York, Washington and Chicago, was completely equipped with air conditioned cars May 22.

This is the third through train operated by this railroad, the pioneer in air conditioning in rail transportation, to be so equipped. The first of these was the *Columbian*, which was conditioned on May 24, 1931. The *National Limited*, inaugurated on April 21 this year between New York, Washington, Cincinnati and St. Louis, was the first long distance sleeping car train to be air conditioned.

## District Heating Association Plans Full Convention Program

Reports and addresses covering technical development and practice, as well as the commercial

**Left to right—J. S. Jung, general chairman, committee on arrangements; Mrs. E. A. Jones, hostess; W. H. Wilson, vice-chairman, committee on arrangements, are preparing for the semi-annual meeting of the American Society of Heating and Ventilating Engineers, to be held in Milwaukee.**



**G. L. Larson (left), chairman, committee on reception and registration, and H. F. Haupt, chairman, entertainment committee, A.S.H.V.E. summer meeting.**

aspects of the business, are included in the program of the twenty-third annual convention of the National District Heating Association, to be held at the William Penn Hotel, Pittsburgh, Pa., June 14-17. The program follows:

**June 14**

10 a.m.—President's Address, W. W. Stevenson.
Report of the Chicago World's Fair Exhibit Committee, by L. S. Smith.
Report of Educational Committee, by J. H. Walker, chairman.
Report on Handbook, by C. H. B. Hotchkiss, editor.
Report of the Pure Air Committee, by J. H. Walker, chairman.
Financial Report, by D. L. Gaskill.

2:30 p.m.—Report of Meters and Accessories Committee, by E. A. Lueky, chairman.
Report of the Sales Development Committee, by J. E. Seiter, chairman.
Sales Organizations—address by Geo. E. Whitwell.

**June 15**

10 a.m.—Report of Station Operating Committee, by H. J. Bauer, chairman.

Discussion

1. The Effect of Accident Prevention on Production Costs, by E. P. Durfee.
2. The Selection and Utilization of Fuels, by J. R. McCausland.
3. Operating Experiences with Pease Anthony Gas Scrubbers, by M. D. Engle.
4. The Training and Development of Plant Personnel, by R. H. McCumber.
5. Report of Committee on Feed Water Treatment—"Continuous Blow Down Systems," by A. R. Mumford.
6. One Method of Estimating Peak Demands on a Steam Heating System, by R. G. Felger.

Report of the Hot Water Committee, by R. C. March, chairman.
8 p.m.—The Manufacturers' Round Table. The entire evening will be devoted to presentation and discussion of manufacturers' equipment. New developments in apparatus, new methods of construction, or improvement in existing apparatus, will be discussed by the manufacturers.

**June 16**

9:30 a.m.—Report of the Commercial Relations Committee, by S. S. Sanford, chairman.
Report of the Rates and Regulations Committee, by John W. Meyer, chairman.
Report of the Research Committee, by E. E. Dubry, chairman.
Effective Present-Day Sales Activities of Utilities and Manufacturers—address by J. M. Hopwood.

**June 17**

9:30 a.m.—Election of Officers.
Report of Operating Statistics Committee, by A. D. Leach, chairman.
Report of the Distribution Committee, by John F. Collins, Jr., chairman.

Discussion

1. Distribution Line Losses and Unaccounted-for Steam, by Edward Lenz.
2. Comparison of Standard Conduits, by Raymond M. Nee.
3. Comparison of District Heating System Designs, by Leven D. Gray.

Installation of New Officers.

## Government Building Program Shows Progress

An announcement made public April 7 by the U. S. Treasury Department reports progress in the carrying out of the Government's public building construction program, involving a total authorized expenditure, to date, of over 496 million dollars. This program is largely a result of the Government's policy to provide appropriations for necessary public works construction during times of economic depression.

Projects under contract, either in whole or in part, on April 1, amounted to $257,543,700, while the projects reported completed at that date amounted to $57,067,569. At the same time, there were buildings in project for which the plans were complete and the sites selected, on the market for bids, involving $68,517,023. There are also a number of buildings for which the sites have been selected, but for which the plans are only partially complete. This work is distributed throughout the entire country.

## Midwest Coal Conference Investigates Heating Problems

Economy in fuel consumption, resulting from improved building insulation, was discussed by A. P. Kratz, research professor, University of Illinois, in an address entitled "Influence of Building Construction on Fuel Consumption," delivered at the fifth annual Midwest Bituminous Coal Conference, held at Lafayette, Ind., under the joint sponsorship of Purdue University, and the University of Illinois, April 14-15. The conferences are held in the interests of the coal producers of Indiana and Illinois, in an effort to improve and extend the use of coal. Participants, of which there were 320 registered, included dealers, buyers, stoker men, engineers, and producers.

"Trouble Shooting in Small Heating Plants," was the subject of a lecture by C. J. Klermund, Chicago, Ill., and the matter of improving service to domestic coal consumers was also given attention.

A considerable portion of the conference was devoted to a discussion between coal men and stoker manufacturers in an effort to promote

better cooperation in order successfully to combat the inroads of competitive fuels. Changes in stoker design, to increase the number of varieties of coal an individual stoker can burn, in order to reduce the number of grades of coal that must be supplied at present, are under consideration.

## Milwaukee School Plans Course in Air Conditioning

An intensive short course in air conditioning is planned for this fall by the School of Engineering of Milwaukee, Milwaukee, Wis. Classes will meet three nights a week for ten weeks, and will hear lectures covering fundamental theory, a study of air and air flow, and a comprehensive survey of the various kinds of equipment used in air conditioning work.

Lecturers for the course will be: Roy McCall and V. M. Murray of the mechanical engineering department of the institution; Ernest Szekely, chief engineer, Bayley Blower Co., Milwaukee, and Edwin A. Jones, air conditioning engineer, L. J. Mueller Furnace Co., Milwaukee. No educational prerequisites are necessary for enrollment. The date of starting has not been announced.

## Arkansas Contractors Watching Future of Air Conditioning

Action was taken by the Arkansas Master Plumbers' Association at its tenth annual convention, held at Little Rock, April 11-12, to confine air conditioning to the plumbing and heating industry by urging the National Association of Master Plumbers to call to the attention of manufacturers of such equipment the advantages to be gained by merchandising their products through that industry.

The association also voted to determine the methods employed in fixing the prevailing rate of wage now required on Federal work. This resulted from a discussion in which several speakers alleged that the prevailing rate is fixed arbitrarily, and that in some cases contractors had been required to pay more than the actual rate prevailing at the time.

All forms of consumer sales by wholesalers were condemned by the association in a resolution passed at the meeting. The organization also went on record as endorsing the proposed bill for separation of the general and mechanical contracts on Federal construction, and the bill requiring general contractors to submit the names of their sub-contractors, and material and supply dealers with their bids on Federal work.

Officers for the new year were elected as follows: Arthur P. Pfeifer, Little Rock, president; Walter S. Duggans, Fayetteville, vice-president; Joe H. Bilheimer, incumbent, secretary; Al Borman, Hot Springs, treasurer.

## Modernizing Equipment to be Featured at Master Plumbers' Exposition

Development of modernizing work as a means of expanding business volume in the face of curtailed activity in new building will be the idea featured in most of the displays at the exposition to be held in conjunction with the Golden Anniversary Convention of the National Association of Master Plumbers, Madison Square Garden, New York, June 20-23. More than 100 manufacturers of heating and sanitary equipment will present displays of their products, which are expected to cover a wider scope than ever before, and an unusual effort is being made to attract the consuming public to the exposition.

Business sessions of the convention will cover a three-day program. Daily sessions will open at 10 a.m. and adjourn at 2 p.m. on Tuesday, Wednesday, and Thursday, and these sessions will be followed on Tuesday and Wednesday by afternoon educational programs sponsored by the sales promotion committee.

## Bill for Listing Subcontractors Favorably Reported

A favorable report was turned in on May 11 by the House Committee on Expenditures in the Executive Departments, on the Goss Bill (H. R. 9921) which would require contractors on public works construction to name their subcontractors, material men, and supply men, when submitting their bids. The bill is designed to curb the practice of bid shopping, which is said to prevail in connection with Government contracts.

Advocates of the measure believe that its passage would protect both the subcontractor and the Government. In his anxiety to obtain the work in the face of cut-throat competition, fostered by the main contractor, the subcontractor is driven to sacrifice profit, and is threatened with loss. Also, inferior work may be delivered to the Government, as a result of the main contractor's irresponsibility in his selection of the lowest-bidding subcontractor.

## A.O.B.A. Issues Two Publications on Oil Heating

Two publications of general interest to manufacturers and dealers engaged in the oil burner business and allied lines have been completed by the American Oil Burner Association. The first, entitled "A Five Fold Survey," is the result of a national canvass made by the association, and covers a survey of schools using oil-burning equipment, a comparison of oil and other fuels, a study of warm-air heating, gas and stoker competition, and dealer status with respect to lines handled and types of heating systems favored.

"A Digest of Law and Cases on Heating Systems and Devices" is the title of the second publication, a 344-page pamphlet by S. A. Raboy, which contains a digest of legal opinion and rulings as they apply to oil burner installation work.

## Congress Urged to Stimulate Government Building

A bill (H. R. 11989) providing for the expenditure of $1,300,000,000 for public building construction, to be financed by bond issue, was introduced May 10 in the House by Representative Keller of Illinois. The buildings provided for are mostly post offices, the eligible towns consisting of those not already possessing a Government-owned building for this purpose and whose receipts during the year 1931 reached

# News of the Month

$8000. Certain other projects would be authorized by the bill, and the total number of buildings that would be included is 3288.

Construction of post office buildings all over the country would distribute the work to a much greater extent than if the program were limited to the provisions of the Employment Stabilization Act of 1931. The bill provides that bids be submitted within 30 days of the enactment of the measure, and stipulates that local contractors will receive preference, and that local labor shall be used. The bill directs the architect of the Capitol to prepare 12 floor plans, which shall be varied to suit postal requirements, and 12 different exterior designs, having due regard for local architectural styles, to facilitate the work. Local architects may be used to supervise construction, on a percentage basis. A five-day week and eight-hour day is made mandatory, and will apply to all persons employed on the various projects set forth in the bill.

### Illinois Chapter Hears Talk on Cooling with Hot Water System

Samuel I. Rottmayer, of the staff of Samuel R. Lewis, consulting engineer, discussed the adaptation of hot water heating systems for cooling and dehumidifying before the Illinois chapter of the American Society of Heating and Ventilating Engineers, at its regular meeting, Chicago, Ill., May 9. For heating, Mr. Rottmayer proposes the usual forced circulation hot water system, using an open water receptacle with a copper heating element for humidification; and a blower incorporated with the radiators. For cooling, he proposes the same system, with the water by-passed around the boiler, and force-circulated through a separate tank with the pump.

Fifty-seven members attended the dinner and meeting, and three new members were welcomed into the chapter.

### Harry W. Arthur

Harry W. Arthur, heating contractor, and owner of the Arthur Service Co., Pittsburgh, Pa., died April 7, in Wilkes-Barre, Pa., at the age of 48.

Mr. Arthur started in the heating business at an early age with his father, Samuel Arthur. Upon the death of his father, he was employed by the Union Radiator Co., Johnstown, Pa. While he was Pittsburgh manager for this company he formed the Arthur Service Company.

Suffering from a nervous breakdown several years later, he went to California for three years, returning in 1930.

## COMING EVENTS

**JUNE 6-10, 1932. Twenty-Fifth Annual Convention and Exposition of the National Association of Building Owners and Managers, to be held in Chicago. Headquarters at the Drake Hotel.**

**JUNE 7-10, 1932. Annual Convention of the Smoke Prevention Association, to be held in Toronto, Ont. Headquarters at the Royal York Hotel.**

**JUNE 9-11, 1932. Nineteenth Spring Meeting of the American Society of Refrigerating Engineers, to be held at Massachusetts Institute of Technology, Cambridge, Mass.**

**JUNE 14-17, 1932. Annual Convention of the National District Heating Association, to be held in Pittsburgh, Pa. Headquarters at the William Penn Hotel.**

**JUNE 20-23, 1932. Fiftieth Annual Convention and Exhibit of the National Association of Master Plumbers, at Madison Square Garden, New York.**

**JUNE 27-29, 1932. Semi-annual Meeting of the American Society of Heating and Ventilating Engineers, to be held in Milwaukee, Wis. Headquarters at the Hotel Pfister.**

**JUNE 27-JULY 1, 1932. Semi-annual Meeting of the American Society of Mechanical Engineers, to be held in Bigwin, Canada.**

**OCTOBER 10-14, 1932. Fourteenth Annual Convention of the American Gas Association, to be held in Atlantic City, N. J.**

# Correspondence

### Responsibility for Smoke Nuisance

EDITOR, HEATING AND VENTILATING:

I read with considerable interest the article on page 73 of the April, 1932, issue of HEATING AND VENTILATING entitled "Experts Disagree on Responsibility for Smoke." While not posing as an expert on smoke, I am very much inclined to agree with some of the gentlemen when they state that it is a rather mistaken idea to think a great amount of smoke in large cities comes from apartment houses and domestic fires.

It so happens that my office is located in a spot in our building where I can look out over a certain portion of the residential and apartment house district of Akron, and I am safe in stating that on any cold winter morning the amount of smoke coming from this district is comparatively small in comparison to the smoke that I see in the strictly commercial district and from those plants to which we are still unable to sell steam.

For instance, there is a large and progressive laundry within almost a stone's throw of our plant to whom we sold steam at one time for a short period, but the owner of this laundry is neither progressive enough nor has enough public spirit to buy steam at a somewhat higher cost which will clean up his stack, and in the morning during the firing-up periods, between 7 a.m. and 9 a.m., the amount of smoke that this progressive business man sees fit to spread out over the city is rather a disgrace. This same thing can be multiplied no doubt in a lot of the larger cities where steam is not even available but the owner does not have enough public pride in his city to make any honest attempt to clean the stack.

It also happens that the writer is a member of the Chamber of Commerce Smoke Abatement Committee in this city, and our Superintendent of Schools is chairman of that committee. At our last meeting the writer chided him considerably on the fact that if he would insist that his janitors in the more or less up-to-date public schools which we have, clean up their own smoke stacks, certainly the property owners around the school would appreciate the effort and do their share toward eliminating smoke.

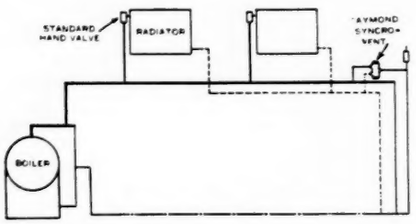
After all, the elimination of smoke, I believe, is a matter of public pride, and when you get enough people interested along that line you will find that the smoke nuisance will decrease in rather surprising amounts.

P. A. HYDE
Sup't. of Steam Distribution,
Ohio Edison Co.,
Akron, Ohio.

# New Equipment

## Raymond Syncro-Flow Heating System

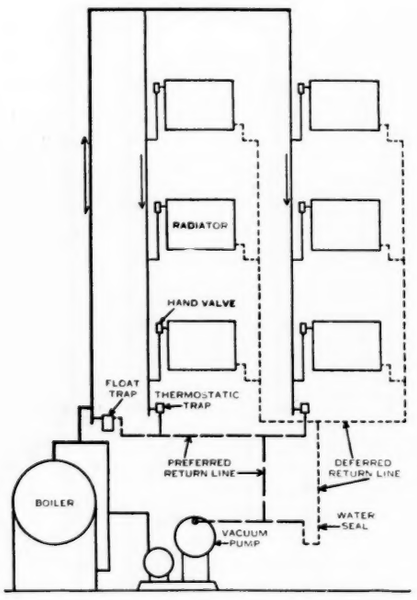
F. I. Raymond Co., 629 W. Washington Blvd., Chicago, Ill., has announced the Raymond Syncro-flow heating system, incorporating a device known as the Syncro-vent. It has been developed to eliminate the tendency for the first radiators on steam lines to receive more heat than the last radiators, when the




**Raymond Syncro-flow heating system**

system is operated intermittently, or at reduced load, as is necessary in mild weather.

By venting the ends of the steam lines separately, and holding the vent from the return lines sealed until all of the steam lines have been vented, it is evident that no steam can enter the first radiators during the period in which the steam mains are filling, since no air




**Large Syncro-flow heating system showing preferred return line**

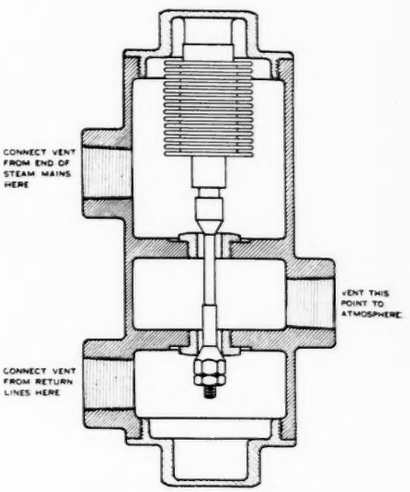
can escape from them into the sealed return lines. Therefore, steam is available to flow simultaneously into all the radiators, when the vent to the return lines is opened, thereby overcoming the tendency for the first radiators to heat up more quickly than the last.

This is accomplished in small systems by use of the Syncro-vent. This device has an upper and a lower compartment, both of which are connected through thermostatically-operated valves to a middle chamber. The end of the steam main is connected to the upper chamber, and the return line is vented to the lower compartment. The middle section is connected to an air vent.

When air is delivered to the upper section, as steam displaces it in the main, the thermostatic element in the top of the vent, being cold, operates to open the upper valve and close the lower, thereby allowing air from the main to pass through the air vent to the atmosphere, and maintaining an equal back pressure in each of the radiators by keeping the return vent closed. As the main is cleared of air, steam enters the upper chamber and the thermostatic element, being heated, operates the valve and closes the vent from the main, and opens that from the return. Therefore, air will be removed from each of the radiators through the return line at the same time, allowing the steam to enter them simultaneously.

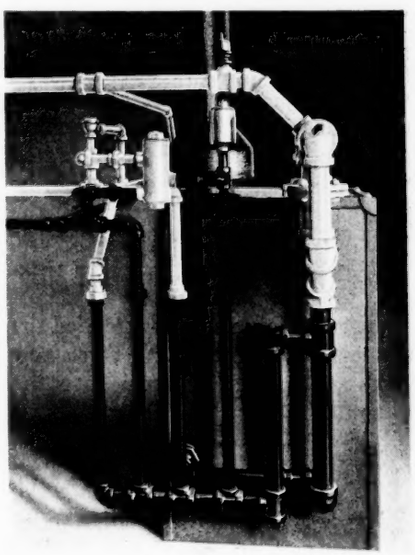
In larger systems, the ends of all the steam mains are dripped and vented through the customary float and thermostatic traps into a separate return, called the "preferred return," which has no connection to the returns from the radiators. This separate return is connected directly to the vacuum pump, with no water pockets or traps. A water seal of 6 in. or 12 in. is inserted in the regular return, near the entrance to the vacuum pump.

Air will be drawn from the auxiliary return line by the vacuum pump, but not from the regular return line, as long as the water seal remains. As a result, steam will be drawn to the ends of the steam lines, and the water seal will not be broken until all of the thermostatic traps at the ends of the mains have been closed by the presence of steam. When air can no longer be drawn from the preferred return line, sufficient vacuum will be induced at the pump to break the water seal, and air will be withdrawn from the regular return, making steam available to each of the radiators at the same time.




**Raymond Syncro-vent**

Standard valves and fittings can be used with the system, and it is said that smaller pipe sizes, such as are used with vacuum systems, are adequate. Orifice plates become unnecessary or optional, except in large systems. When the Syncro-flow system is used in conjunction with Duo-Stat control, made by the

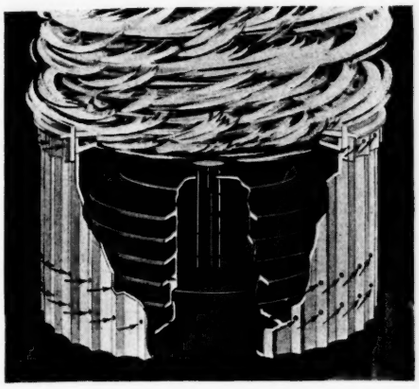


**Syncro-vent connected to boiler**

same company, the manufacturer claims that return elbows can be used on the radiators instead of thermostatic traps.

## Motor Wheel Oil-Burning Equipment

A series of matched boiler and Gyro-Flame oil burner units has been announced by the Heater Division, Motor Wheel Corp., Lansing, Mich. Equipment is manufactured for domestic steam and hot water heating, and for hot water



Gyro-Flame burner

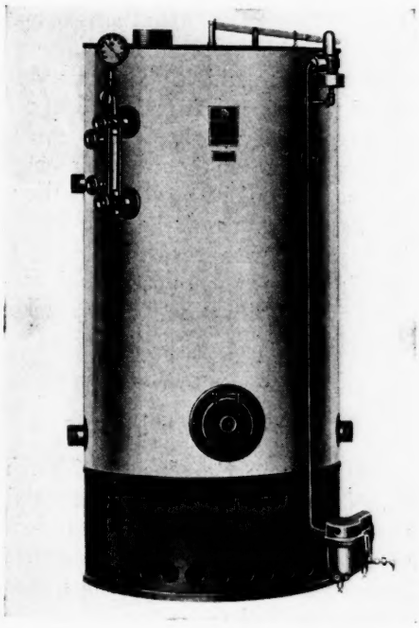
supply for institutions, commercial buildings, and homes.

Moving parts have been eliminated from the burner, electric power being required only to actuate the thermostat. Air is introduced into the burner through three rows of intake openings, located in the side, which impart a rotary motion to it. This whirling motion continues as the air rises into the combustion chamber, where it mixes with vaporized oil, and results in a rapidly revolving flame which distributes the heat uniformly to the vertical tubes in the boiler body.

A pilot light ignites the burner when the thermostatically-controlled oil valve is opened, and the oil supply is cut off automatically to shut down the burner when the temperature reaches the point for which the thermostat is set. A stabilizer regulates the oil supply to meet draft conditions, so that oil is supplied in proportion to the amount of air supplied for combustion. The burner is said to be silent in operation, and starts without noise.

Boilers are constructed of flanged steel, with 2½ in. seamless steel tubes welded in place. A twisted baffle passes through each of the tubes, causing the hot gases of combustion to rotate rapidly as they pass upward, providing constant impingement against the flue surfaces. At the top of the boiler the heated gases are returned downward through a central flue before they pass out the stack.

Outer casings are of heavy gauge steel, lacquered in orange. Mineral wool insulation fills the space between the casing and boiler shell. Boilers are supplied in two sizes for both steam and hot water. The smaller sizes, designated 400-S, and 400-W, are designed for average homes up to seven rooms, and the larger sizes, 800-S and 800-W, are for residences having up to 12 or 14 rooms. Hot water supply heaters are made in two sizes for domestic application, having capacities of 300 gal. and 660 gal. of hot water for a 12-hr. period. The larger sizes, made for commercial buildings and institutions, will supply 150 gal. and 300 gal. per hr., at a rise of 80°.

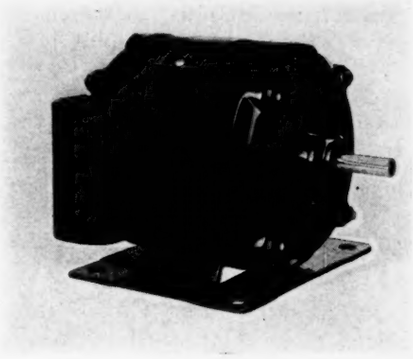


Boiler-burner unit for steam heating

## Wagner Split-Phase Motors

Wagner Electric Corp., 6463 Plymouth Ave., St. Louis, Mo., has announced two split-phase motors, designated 44RB and 56RB, embodying a number of improvements over the former line. The motors are said to be exceptionally quiet and vibration-free.

Features are drip-proof end plates, wool-yarn lubrication, and convenient conduit box, adjustable in four positions. Motors are available in sizes ranging from 1/30 hp. to ¼



Split-phase motor

hp., at 1725 or 1140 r.p.m., and are built for all frequencies.

## Pure-Aire Air Conditioning Units

Pure-Aire Corp., 208 W. Washington St., Chicago, Ill., is manufacturing a line of air conditioning units for use in homes and offices. The device washes, deodorizes and humidifies the air in winter, and circulates cooled, washed air in the summer.

Apparatus is enclosed in either walnut or metal cabinets. An electrically-driven fan draws air from the floor level of the room and discharges it upward, under a constant static pressure, into a metallic air chamber, submerged in water in a storage tank. The air is forced downward through the water, and

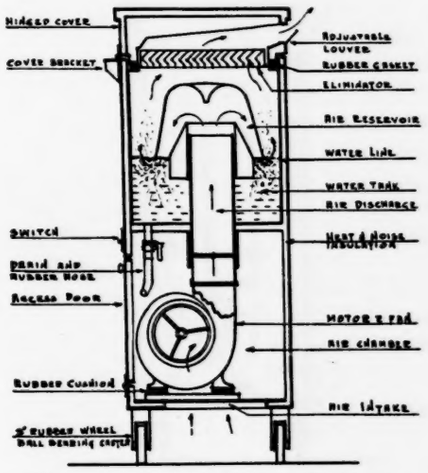



Diagram of Pure-Aire conditioner

then is liberated upward through a mist caused by the air being released through the water.

Capacities of the various models range from 5800 to 23,500 cu. ft. per hr., delivered at the louver.

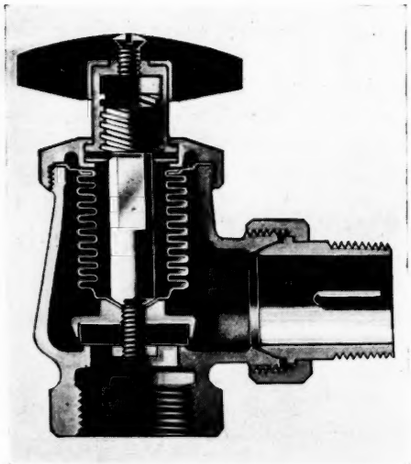
### Copper Radiators Made by Long

A line of copper radiators, for domestic and industrial heating purposes, has been announced by the Long Manufacturing Co., Detroit, Mich., to be distributed by W. T. Walsh, Board of Trade Building, Chicago, Ill.

Resembling an automobile radiator in construction, the radiator operates on low steam pressure. Most of the models are of the built-in wall type.

### Hoffman Packless Radiator Valve

Hoffman Specialty Co., Inc., Waterbury, Conn., has recently introduced the No. 37 packless radiator valve.



Radiator valve

A bellows, surrounding the valve stem, prevents the escape of steam and water, and prevents air from leaking into vacuum pump or one-pipe vacuum systems. The bellows is relieved of torsional strain by means of a slotted washer fitted about the flat sided stem, holding the washer rigidly in the bonnet.

The valve is designed for a high lift from the seat, providing a large clearance, to eliminate interference in the counter flow of steam and condensate in one-pipe systems. One turn of the hexagonal bakelite handle completely opens or closes the valve. A friction brake prevents creeping of the valve from its seat, due to steam pressure. All working parts are enclosed in the bellows, which prevents damage to them from steam, water, and foreign matter.

The valve is supplied in the angle pattern only, and comes in five sizes, from ½ in. to 1½ in.

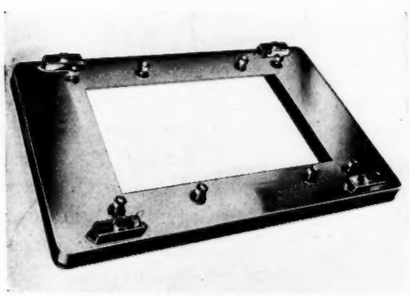
### Kennedy Gate Valve

Announcement of a standard bronze gate valve has been made by the Kennedy Valve Mfg. Co., Elmira, N. Y. The valve is of solid wedge, stationary construction, and is intended for 125 lb. steam pressure, and 175 lb. water pressure.

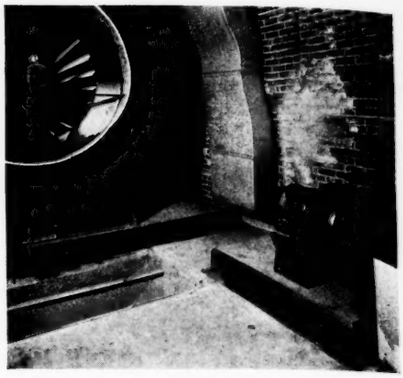
Location of the large hexagonal bonnet nut, close to the hub face nut, where it screws into the body, gives rigidity to the assembly and facilitates removal of the bonnet and stem where clearances for installation are close. The stem engages with the disk to a considerable depth, providing a large number of contact threads, to prevent stripping.

### U.S.G. Resilient Machine Mounting

United States Gypsum Co., 300 W. Adams St., Chicago, Ill., is manufacturing a resilient machine mounting to be installed under mechanical equipment for preventing transmission of vibrations into the supporting structure. By absorbing the vibrations set up in the machine the mounting not only serves as noise insulation, but also protects the equipment from shock and wear resulting from the reactions set up in the rigid support, counteracting the vibrations in the machine.



Top view of U.S.G. mounting



Mountings under fan and blower

Mountings are constructed of steel, all joints and connections being either welded or riveted. The lower portion is anchored to the supporting structure, and the upper portion, which carries the equipment to be insulated, rides on resilient springs. These springs are of heat-treated, high carbon steel cadmium-plated, or otherwise protected against corrosion. The springs are normally loaded to approximately 20% of their ultimate strength. Each mounting is equipped with a locking arrangement, to prevent damage to the spring supports during transit and installation. Snubber springs are also provided for stabilizing the machine.

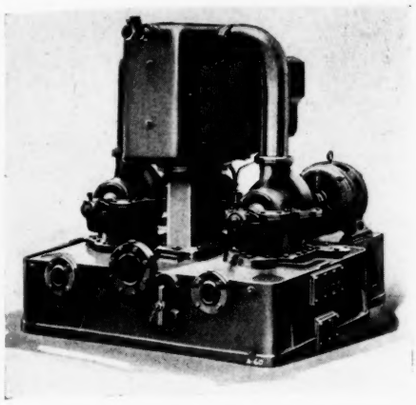
Mountings normally occupy a slightly larger floor area than the machine's bed plate, and are approximately 2½ in. high. They vary in weight between 5% and 10% of the average total weight of the equipment placed upon them. Each mounting is designed to meet the particular requirements of the machine to be treated, with regard to weight, speed, torque, amplitude and frequency of vibration, and similar conditions.

### Ames Vacuum Pumps

Ames Pump Co., Inc., 30 Church St., New York, N. Y., has announced the type E and type F low return vacuum heating pumps. The first has vertical mounting of the motor and pump, and the other has motor and pump supported horizontally.

Units may be had in either single or duplex models.

A low-return inlet and condensation storage chamber permit float-controlled gravity drainage of basement radiation and, in some installations, eliminate the necessity for placing the unit in a pit. Stuffing boxes are under pressure, preventing air from leaking into the system through the pump, reducing power consumption and retarding pipe corrosion. It is claimed that quiet and vibrationless operation has been achieved by dynamically and statically balancing the rotating parts, and by the use of ball bearings on both the pump and motor. Vertical models have motor and pump assembled in one unit, eliminating any possibility of shaft misalignment. Motor speed is kept within 1800 r.p.m.



Ames type F pump

All internal parts, such as impellers, wearing rings, distance sleeve, stuffing box glands, and ejector, are of bronze. Units will produce a vacuum of 23 in. to 26 in., if tightness of system and temperature of returns permit.

Five sizes of type E are made, ranging in pump capacity from 12 to 65 g.p.m., capable of handling from 5 to 21 c.f.m. of air. The larger sizes are made with the horizontal support, and these range in pump capacity from 100 to 200 g.p.m., and extract from 37 to 84 c.f.m. of air. Maximum rated discharge pressure for all models is 40 lb. per sq. in.

## Improvements in Buckeye Heatovent

Several improvements in its line of Buckeye Heatovent unit ventilators have been announced by the Buckeye Blower Company, Columbus, Ohio. Among these are a high velocity discharge grille, which delivers the air vertically, and an upper radiator, used in combination with a lower radiator for quick heating before occupancy, and which is automatically cut out when the desired equilibrium of temperature has been reached.

The ventilator is equipped with a recirculating and inlet damper, with a patented locking device, and stationary wall louvers for taking in outside air.

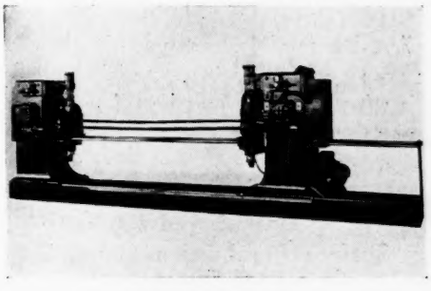
## Mason High Temperature and Pressure Valve

Mason Regulator Co., Boston, Mass., has announced a reducing valve for use with steam pressures and temperatures as high as 600 lb. and 750° F. Materials for all parts are selected to prevent destruction by corrosion and erosion, the body being cast of chrome-molybdenum steel, and the main and auxiliary valves made of Nitralloy, an extremely hard metal. The valve has been designed to reduce turbulence of flow, and to permit easy disassembling.

## Soldering Fins to Tubes by Electric Resistance

Thomson-Gibb Electric Welding Co., Bay City, Mich., has announced a unit for rapidly soldering flanged fins to copper tubing, in the manufacture of heating surfaces and similar applications. Direct-controlled heat is applied to the work by electric resistance.

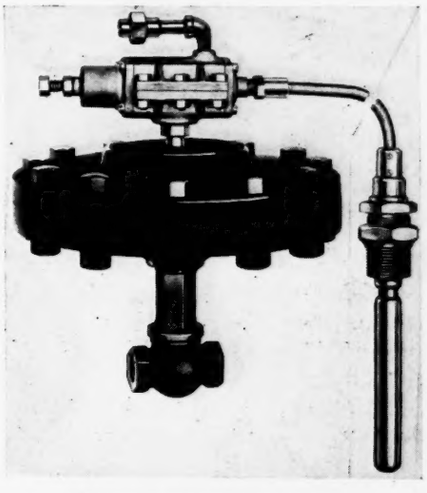
Units consist of two similar machines, one of which is fixed to the base, and the other adjustable along the bed through a distance of 10 ft. by means of a motor-driven worm reduction gear. Each machine carries its own transformer, one side of the secondaries being connected to a heavy bus bar, and the work to be heated completing the secondary circuit. The heating unit to be soldered is assembled, solder and acid applied, and the fins put in place. It is then clamped into the machine by means of adjustable air cylinders, and the current is turned on. The soldering operation is complete in a short time, depending upon the number of tubes. From three to twelve tubes can be handled at one time by the machine.



Welding machine

## Tag Steam-Operated Controller

C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y., is marketing a steam-operated temperature and pressure controller. The device utilizes the pressure in the steam line to operate a diaphragm valve.



Steam-operated controller

A poppet valve, actuated by a thermostatic bellows, regulates the control port and is contained in the control head. A flexible tube connects the thermostatic bellows with the temperature sensitive bulb. Adjustment for operation at any temperature and pressure is made by turning the screw in the control head, which increases or relieves the pressure of a spring against the control valve.

Steam enters the main valve above the seat, and its pressure is conducted simultaneously to the chamber above the diaphragm, and

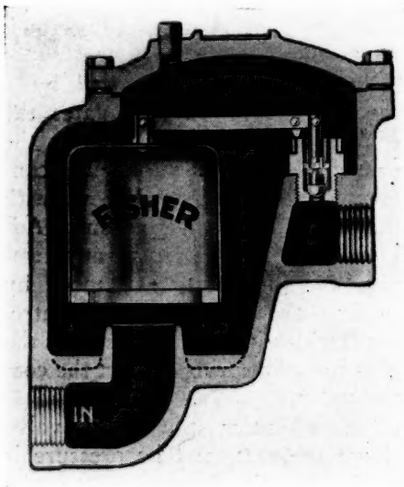
the corresponding chamber below it, thereby equalizing the pressure on both sides of the diaphragm. When no differential of presuure exists between the two sides of the diaphragm, a spring on the valve stem will retain it in the closed position.

If, however, the steam is allowed to escape from the upper chamber, the pressure will not be equalized, and the valve will open against the spring. If the bulb is maintained at the controlling temperature, it will exert a moderate pressure in the bellows in the control head, allowing sufficient steam to escape from the upper chamber to maintain the correct differential of pressure to hold the steam valve partially open, allowing enough steam to pass to maintain the temperature. A reduced temperature at the bulb allows the bellows to contract, permitting the steam valve to open further. A temperature greater than that for which the control is set will cause the bellows to expand, closing the control port, and equalizing the pressure above and below the diaphragm, so that the spring will close the steam valve.

## Fisher Inverted Bucket Steam Trap

Fisher Governor Co., Marshalltown, Iowa, is manufacturing the class ST inverted bucket type steam trap.

Semi-steel is used for the body and cover, and the bucket is of spun brass. The lever and pins are constructed of stainless steel, and stainless steel is used in the valve and orifice seat. A small hole in the top of the bucket allows air to pass and discharge when the valve opens.

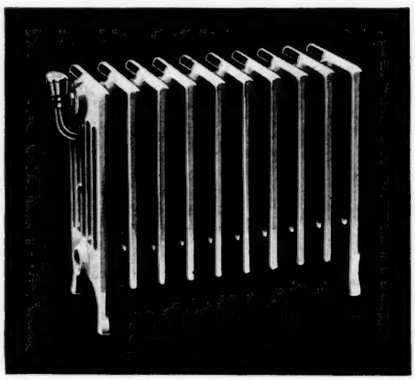



Section through steam trap

Traps may be supplied having inlet and outlet pipe sizes from ⅜ in. to 1¼ in. Capacities of the various sizes range from 150 lb. of water discharged per hour, at a pressure of 10 lb., to a discharge of 11,250 lb. of water per hour, at a pressure of 125 lb.

## Air Conditioning Radiator

Humid-Heet is the name designating an air conditioning radiator, manufactured by Richardson & Boynton Co., New York, N. Y. The radiator may replace present steam or hot water radiation, and requires the addition of a water supply pipe and a drain for overflow.



Humid-Heet radiator

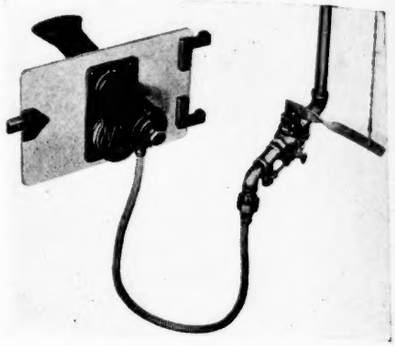
Water is conducted to a reservoir at the top of the unit, from which it is conducted to a water compartment cast in the top back of each section of the radiator. Rate of flow into the reservoir is regulated by an intake valve, and an overflow pipe conducts excess to the drain. The water compartments are open to the atmosphere, and the rate of evaporation is in proportion to the temperature of the radiator.

Units are available in 4, 5, 6, and 7 tube models, ranging in height from 14 in. to 38 in., and in capacity from 2½ to 6 sq. ft. of radiation per section.

## Firedor Gas Burner

Surface Combustion Corp., Toledo, Ohio, is manufacturing the SC Firedor, a gas-fired appliance for carrying the house-heating load during the months when outside temperatures are extremely variable, and yet not sufficiently cold to require a continuous fire in the heater.

The unit consists of a modified venturi adjustable mixer, with an adjustable orifice, and a fish tail nozzle. The mixer slides through a front plate casting, mounted on a transite door which replaces the regular furnace door. An adjustable opening below the mixer provides for a secondary air control.



Firedor burner with upstairs control

A throttling valve, operated by a chain, is supplied for controlling the burner from upstairs. For this purpose, a by-pass is provided around the valve, through which sufficient gas is supplied to the burner to keep it ignited when the valve is closed. When the burner is to be controlled from the cellar, a globe valve replaces the throttling valve, and the by-pass is eliminated, the burner being ignited by hand.

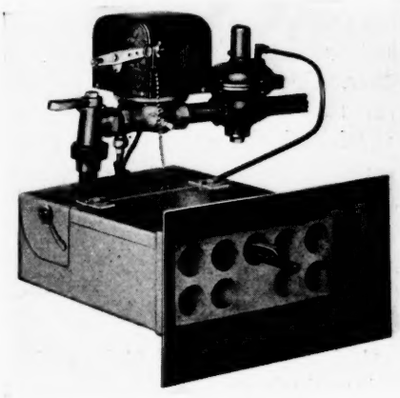
Units are supplied in two sizes, having capacities of 130 and 200 cu. ft. per hr. of artificial gas, at a pressure of 2½ in. of water. Gas connections are ½ in. for the smaller, and ¾ in. for the larger. A transite board to be fitted on the job is included with the equipment.

## Mettler Conversion Burners

Lee B. Mettler Co., 406 S. Main St., Los Angeles, Calif., has introduced the Series C. conversion gas burner, for domestic heating boilers and furnaces.

Combustion takes place in a refractory mixing block, placed over the end of the burner adjacent to the gas manifold. There are several mixing chambers in the block and air, entering at the rear, is mixed with fuel gas, introduced through

multiple nozzles at the entrance to the refractory. The manufacturer refers to this type of construction as entrained combustion, due to the fact that combustion commences near the point where the gas is introduced into the air stream, and continues, reaching completeness near the end of the refractory chamber.



Mettler Series C gas burner

Air flow is regulated by a damper that may be either hand operated or automatically operated. Gas flow is controlled by an electric motor valve.

The burners are made in four sizes, and capacities range from 800 sq. ft. to 7500 sq. ft. of steam radiation.

## Century Capacitor Motors for Fan and Oil Burner Drive

Century Electric Co., St. Louis, Mo., has added a series of capacitor motors to its line of single phase motors, the operating characteristics of which cover a wide range of applications, including fans, oil burners, and refrigerators.

Motors range in size from 1/6 hp. to 10 hp., and are furnished for single or multi-speed operation, at high, low, or intermediate torque. Capacitor boxes are mounted on top of the motor in the small sizes, and the intermediate and large sizes are furnished for either wall or floor mounting.

## Peters Heat Transfer Element

Heating & Ventilating Equipment Co., 228 North LaSalle St., Chicago, Ill., is manufacturing the Peters heat transfer element for use in unit heaters, unit coolers, and air conditioning apparatus. The element is available in aluminum, acid- and alkaline-proofed aluminum, bronze, or rust-proofed iron, making it adaptable for use with any heating or refrigerating medium.

Radiating surfaces, headers, and medium chamber are cast integrally, resulting in uniform expansion and contraction. The core is elliptical in section to allow unrestricted flow of the medium and air.

## Small Silvertop Trap

An unusually small steam trap, the No. 11 Silvertop, has been announced by the V. D. Anderson Co., Cleveland, Ohio. It is intended for use on heating coils, unit heaters, and other types of small steam-using units.

Working parts are of heat treated stainless steel, and the valve and seat are of nitralloy. The trap may be disassembled for inspection by the removal of one bolt without disturbing pipe connections. It is regularly furnished with ½ in. connections, but is obtainable with ¾ in. connections. For use in connection with decorative equipment, it may be had finished in highly polished chrome plate.

Small steam trap

## Chelva Electric Heating Units

Chelva Heat, Inc., 56 Earl St., Newark, N. J., is manufacturing and distributing a line of automatic electric heating units for home, office, and institution use.

Apparatus consists primarily of a vapor-filled core, electrically heated, and placed in a cabinet through which the air of the room is circulated by convection. The core is of welded construction, and is trapezoidal in section. Copper fins surround the core, spaced at ¼ in. intervals. In contact with the core, and inside the bottom loop of the fins, a strip electric heating element is located.

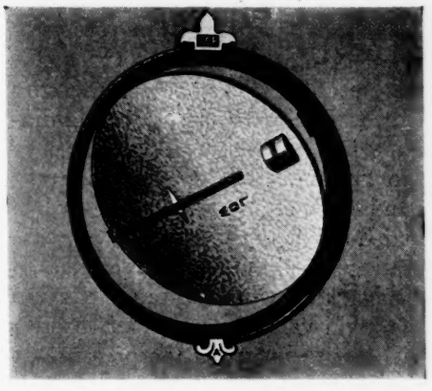
A chemical product, resembling camphor, and for which a heating effectiveness considerably higher than water is claimed, is introduced into the core, which is hermetically sealed with the air exhausted. The core, with its electric heating element, is mounted within a wooden cabinet, by means of an aluminum plate, and asbestos insulation prevents damage to the cabinet.

A Mercoid automatic thermostat, having an outlet box containing fuse block and terminal plate, and suitable provision for connection to the lighting circuit, controls the device. It is said that a temperature regulation of within 2° at the breathing line, and 3° throughout the room is attained.

The units are obtainable in four sizes, the output equivalents ranging from 9 sq. ft. to 32 sq. ft. of steam radiation. Standard range of thermostat control for all sizes is from 45° to 72°, and thermostats having a range of 38° to 60°, or 56° to 80°, may be had if specified.

## Draft-O-Stat Draft Control

A draft control, the Draft-O-Stat, has been introduced by the Hotstream Heater Co., Cleveland, Ohio. The device is inserted into the stack between the heater and the chimney, or in the chimney below the thimble. The flutter is adjusted, by means of a screw setting, to a posi-

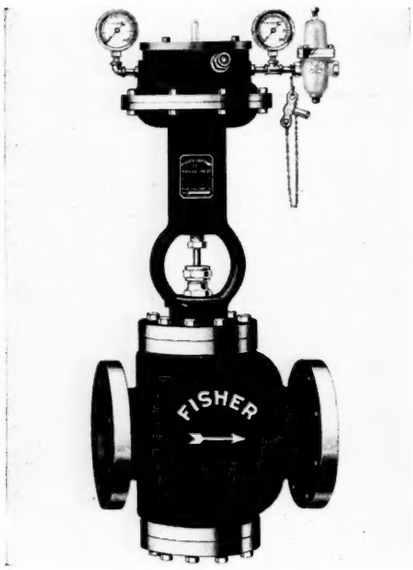


Draft regulator

tion to give the minimum draft for efficient combustion. Part of the air is then drawn directly from the cellar, thereby by-passing the heater and reducing the excess air.

## Fisher Auxiliary Actuated Pressure Controller

Fisher Governor Co., Marshalltown, Iowa, has developed the series




Fisher pressure control

4200 Wizard pilot pressure controller, for regulating the pressure of steam, water, gas, oil, and other fluids, or for boiler pressure control, by regulating gas or fuel oil supply.

Auxiliary air or gas is used as an operating medium, and this is controlled by a pilot valve actuated by a Bourdon tube, connected into the main line. When no pressure exists in the main line, a spring holds the main valve open, and the Bourdon tube is contracted, holding the pilot valve open and bleeding the auxiliary pressure, so that no pressure is exerted against the operating diaphragm. As pressure is turned into the system, the Bourdon tube expands, throttling the pilot valve, and building up pressure in the operating medium, which exerts a force against the diaphragm, causing the main valve to close and throttle the flow to maintain the pressure at the point for which it is set. A drop in the reduced pressure will cause the Bourdon tube to contract, opening the pilot valve, and the increased bleed of the auxiliary operating medium will reduce the pressure on the diaphragm, allowing the spring to open the main valve.

Incorporation of the pilot with the main valve eliminates the time lag, making the valve extremely responsive to slight pressure variations. Adjustment for operation at any point over the pressure range of the device is effected by turning a screw at the side of the case. The unit may be easily converted from a pressure reducing valve to a pressure relief valve by a simple change in the pilot valve.

Controls are built for pressure ranges of from 5 lb. to 15 lb. and from 200 lb. to 500 lb. They are constructed to order for the installation for which they are to be applied.

## Barcol Duplex Thermostat

A duplex thermostat, suitable either for general use as a two-temperature thermostat or for applicatons requiring control of double range circuits, has been announced by Barber-Colman Co., Rockford, Ill. The instrument is essentially two room-type thermostat units mounted side by side, individually adjusted to any range between 60° and 80° by means of a lever and scale at the bottom of each unit. The duplex differs from the company's two-temperature thermostat in that

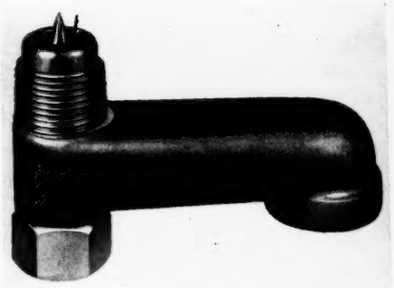
Duplex thermostat

there is no provision for manual or magnetic switching.

In heating installations where a night temperature lower than that maintained during the day is desired, the duplex may be used as a two-temperature thermostat by using an external switch for throwing the control from one unit to the other. One unit is adjusted to control the normal daytime temperature, and the other is set for a relatively lower temperature, and placed in control during the night.

## Dunham Adjustable Regulating Fitting

C. A. Dunham Co., Chicago, Ill., is introducing an adjustable regu-



Adjustable regulating fitting

lating fitting with which balanced operating conditions may be brought about in steam heating systems, by accurately apportioning the flow of steam to concealed radiation.

A conical valve can be adjusted up and down to give an infinite number of port openings. This is accomplished by removing the cap at the bottom, and turning the screw. The adjusting screw can be turned up tight, to serve as a valve to close off the steam entirely when the trap is being cleaned or inspected. The fitting is screwed directly into the bottom tapping of the radiator, and the port through which steam enters is higher than the bottom of the radiator tube, preventing accumulation of water interfering with steam flow, and causing noise.

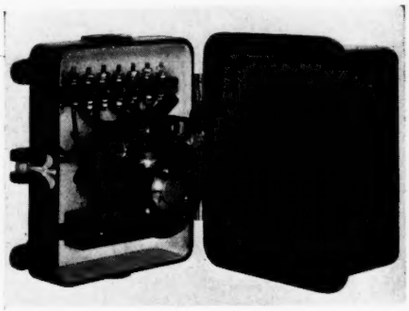
## Relay for Motor-Operated Controllers

Automatic Temperature Control Co., Inc., Philadelphia, Pa., is manufacturing the Motomerco relay, for the operation of motor-operated

controllers, signal lights, interlocking of electrical circuits, and similar applications, when actuated by a pyrometer, thermometer, pressure gauge, or other contact instrument.

Apparatus consists of mercury contact tubes, mounted on a vertical disk which is rotated by a reversible motor in such a way as to tilt the tubes to close the desired control circuit through mercury. The relay motor draws only 4 watts at 110 volts, a. c., and is said to be free from contact troubles.

The device is obtainable in three types, each suited to a particular application. Type 1300-A is a three-position three-circuit relay, which will pick up one of three distinct control circuits when actuated by



Motomerco relay

an instrument having two sustained contacts for low and high positions with an intermediate no-contact position. Type 1300-B is a holding-in type of three-position three-circuit relay, which can be actuated by an instrument having three intermittent contacts for low, normal, and high positions. Type 1300 is a two-position, two-circuit relay, with adjustable time lag, for actuation by an instrument having a single sustained contact. A time lag of up to 25 sec. can be introduced to prevent vibrational changes or rapid fluctuations in the actuating instrument from setting the relay into operation.

## Goss Humistat and Humidimeter

Humidity Control Co., 303 Bernice Building, Tacoma, Wash., is marketing the Humistat, a control for use in conjunction with an electrically-operated solenoid valve for regulating relative humidity.

An actuating element, compensated for plasticity, operates a mercury tube switch, which opens or closes the valve controlling the flow of water to the humidifier or furnace. It is said to be unaffected in its accuracy by temperature changes between 30° and 130°, and to operate on a differential of less than 1% relative humidity. Rapid circulation of air about the instrument is not necessary, and its accuracy is not impaired by ordinary dust and dirt.

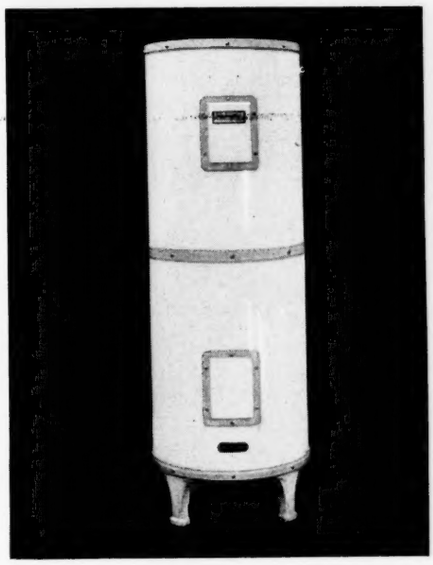
The device is equipped with a 3-amp. 110-volt mercury tube switch, but can be used with low voltage, if desired. Either direct or alternating current can be used.

An instrument for indicating the relative humidity, called the Humidimeter, is also produced by the same manufacturer. It covers a range of from 15% to 80% relative humidity, and readings are said to be within 3% of the readings of a standard sling psychrometer.

## Westinghouse Water Heater

A new line of water heaters has been placed on the market by the Westinghouse Electric & Mfg., Co., East Pittsburgh, Pa. Two types are made, the automatic, single heater tank, and the Adapt-o-matic, two heater tank.

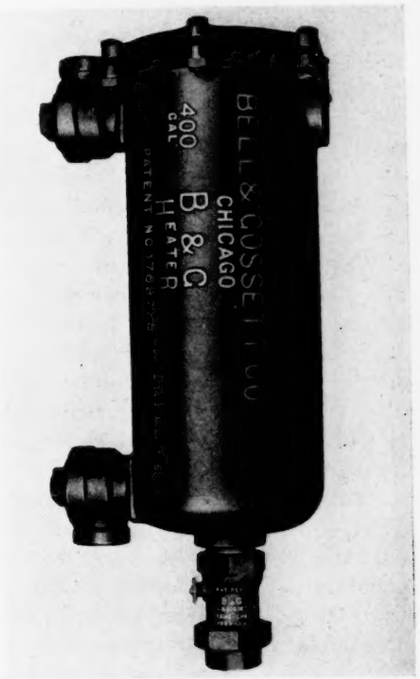
An adjustable thermostatic control, permitting a temperature range of from 130° to 180°, has been installed. This provides for more economical operation, where water temperatures lower than the usual fixed temperature of 160° are satisfactory. Tanks are made in 10, 30, 50, and 80 gal. capacities, and 100 gal. tanks are available on special order. They are furnished in a white cordovan, grey-trimmed exterior.



Electric water heater

## Temperature Control for Indirect Water Heaters

Bell & Gossett Co., 3000 Wallace St., Chicago, Ill., has placed on the market a device for automatically controlling the temperature of water




Temperature control on indirect heater

in domestic indirect water heaters. The control is called the Thermo-Chek.

Regulation of the temperature is effected by a thermostatically-operated butterfly valve, which controls the flow of water from the boiler to the heater coil. In this way, water in the tank is prevented from becoming overheated when operating the boiler at temperatures as high as 220° during the heating season, although the average boiler temperature may be much lower in the summer. A small dial on the side of the device can be set for any desired water temperature. In localities where hard, scale-forming water is supplied, the storage tank temperature may be so regulated as to

keep it below the point at which lime precipitation takes place.

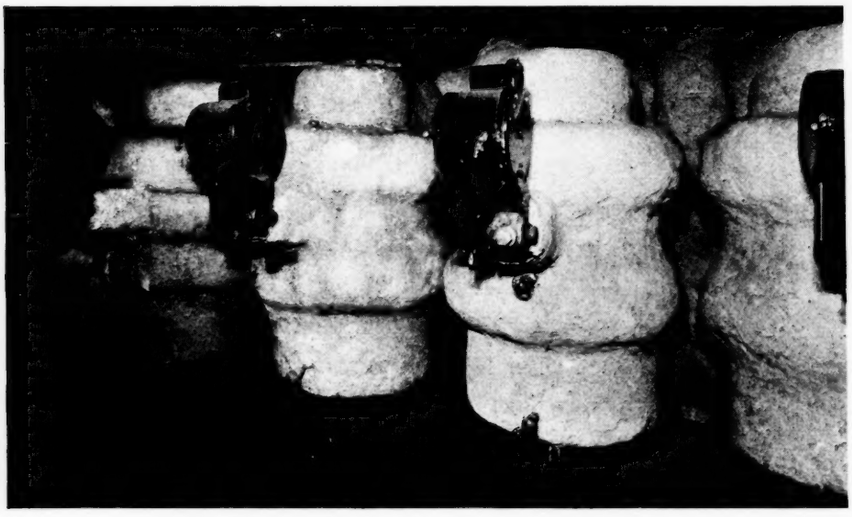
Temperature controls are now included as standard equipment on all double coil water heaters made by the company, and they may be purchased for use with all sizes of B & G heaters, or all other types and makes of indirect water heaters.

### Eagle-Picher Insulating Material

An insulating cement, designated Eagle 66, is being manufactured by The Eagle-Picher Lead Co., Insulation Division, Joplin, Mo. It is made from a dark gray colored fibrous material which is produced by processing the waste materials of lead metallurgical processes. These fibres are said to possess an exceptionally low heat conductivity.

Water is mixed with the cement, and the plastic mortar is applied by hand or by a trowel to the cleaned surface to be insulated and then smoothed. The insulation is suitable for use with temperatures up to 1500° F., and can be reclaimed and used again after being subjected to temperatures up to 1200°. Fifty square feet of surface can be coated 1 in. thick with 100 lb. of the cement. It is said by the manufacturer that it will not shrink and crack. No reinforcing is required when covering pipe fittings, and the cement will stick to any hot or cold clean surface.

Other insulation products manufactured from the same fibrous material include boiler setting cement, waterproofing cement, calking compounds, pipe insulation, insulation to be blown into the walls of houses, and insulating blankets for covering large flat surfaces.



Insulating cement in meter room of steam station

### Kool-A-Room Portable Cooler

A portable room cooler, the Kool-A-Room, has been announced by Standard Engineering Works, 4343 Duncan Ave., St. Louis, Mo. The device uses ice as a refrigerant, and is intended for domestic, office, and similar uses.

Ice room cooler

Units are enclosed in a hexagonal cabinet of lacquered steel, insulated against waste when not in operation. Circulation is accomplished by means of a two-speed electrically-driven fan, plugged into the lighting circuit. Incoming air from the room passes through a filtering bag in the base to remove dust and dirt, and after being cooled by the ice, is discharged through six openings at the top. An ozonator can be installed for revitalizing and deodorizing the air. Either cracked or block ice is charged into the cooling tank through the top, and a drain is conveniently located for removing the water.

Units stand 59 in. high, and are 28 in. in diameter. The standard motor operates on 110 volt, 60 cycle alternating current, but can be furnished for other frequencies, or direct current. A single unit is said to be adequate for a room 20 ft. x 16 ft. x 9 ft.

### Auxilor Stack Loss Eliminator

Health Air Systems, a division of the Economy Baler Co., Ann Arbor, Mich., is offering the Auxilor, an apparatus for removing the waste heat from flue gases in furnace and boiler stacks, and applying it to warm-air heating.

It is installed directly to the rear of the regular furnace or boiler, and the stack is led into the device, so that the flue gases are passed through it before entering the chimney. An intake and discharge air duct connects the Auxilor with the rooms overhead at any desired points, and recirculated air warmed by the stack gases provides an auxiliary to the regular heating system. An automatic by-pass damper remains open when the fire is started until a temperature of approximately 250° is reached, to prevent interference with the draft.

Interior construction is of heavy welded copper alloy steel. The device is 28 in. in diameter, and stands 70 in. high. It can be installed in connection with any steam, hot water, or warm-air heating plant; air washers, humidifiers, or forced air circulators may be used with it.

### Kramer Copper Convectors

Trenton Radiator Works, division of Trenton Auto Radiator Works, Trenton, N. J., is manufacturing a

Copper heating element

line of copper convectors, known as Kramer radiators, for use in schools, apartments, offices, and homes.

Heating element consists of seamless copper tubes which form the steam chambers. The fins are of heavy copper, metallically sealed to the steam tubes. Fins are joined together by an immersion process, to create a flue type of extended surface. The cast headers are designed so as to distribute the steam evenly through the tubes, which are expanded into the headers.

Convectors are supplied in four core depths, and can be obtained in lengths ranging from 18 in. to 60 in., and in sizes to fit enclosures from 18 in. to 50 in. high. Capacities range from 12.6 sq. ft. to 151.8 sq. ft. of steam radiation. Cabinets and enclosures, providing a selection of four different styles of grilles, are available for the convectors.

## American Radiator Oil Burning Boiler

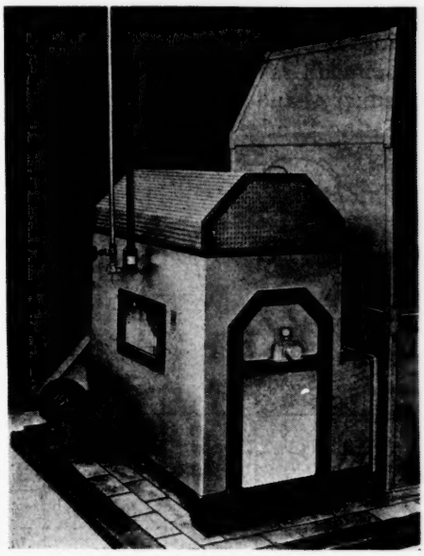
A line of cast iron sectional boilers, designed expressly for use with oil burners, has been developed by American Radiator Co., 40 West 40th St., New York, N. Y. Designated the Ideal oil burning boiler No. 12, the equipment is available for either steam or hot water heating, and may be had for either gun type or rotary burners.

Gas travel is four times the boiler's length, and attention has been given the design of the combustion chamber to promote quick heating. All contact surfaces between sections, as well as on doors and plate work, are machine ground, insuring a tight fit. A tapping is placed in the rear section, leading into the lower flue gallery, for the installation of a stack control, effecting quick response at the time of ignition. Tappings are also provided for connection to an external water heater. A mica observation port in the door permits inspection of the burner in operation.

## Premier Weatherator

Premier Warm Air Heater Co., Dowagiac, Mich., is manufacturing the Weatherator, an air conditioning unit for domestic use. It is installed in the basement, adjacent to the heater, and circulates filtered and washed air, both temperature and humidity-controlled, into the living rooms.

Recirculated air, drawn from the living rooms, is first passed through the primary filter, where the larger dust and dirt particles are screened out, following which the air is drawn through the secondary filter, consisting of treated spun glass, in which fine dust is removed. The air is then washed in water sprays, located just ahead of twin blowers, which further carry on the washing and scrubbing process by mixing air and atomized water through the turbulent action of the revolving blades.



Weatherator attached to warm-air furnace

From the blowers, the air is delivered into a drain chamber and eliminator, constructed of closely spaced zig-zag plates, where it is freed of excess moisture before it is discharged into the furnace, or comes in contact with a heating element connected to a steam or hot water heater.

Weatherator air conditioners may be applied to either warm-air, steam, or hot water heating systems. Units are supplied in a range of sizes and capacities to satisfy all requirements.

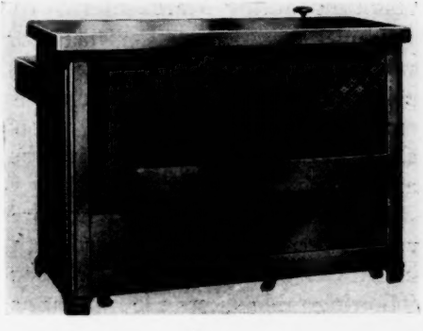
## Thermoil Radiator Units

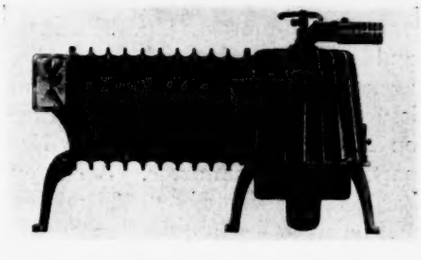
Thermoil Heaters, Benton Harbor, Mich., has introduced an oil-fired radiator unit for garages, filling stations, bungalows, and similar uses. It also provides for a continuous supply of hot water. Units are self contained in a cabinet 28 in. high, and 38 in. long, finished in natural walnut.

Oil supply is a flat reservoir to the rear of the enclosure, next the wall. Air for combustion is drawn in at the top, and is mixed with atomized oil at the entrance to the burner. Flame intensity is regulated by means of a valve having ten adjustment positions. An automatic cut-off, which closes the oil supply in case the flame is extinguished, is provided to prevent the burner from becoming flooded. The oil feed pipe is not subjected to the direct heat of the flame, which minimizes the formation of carbon. A screen and dirt trap prevents clogging of the feed line.

Units are of 5000 cu. ft. capacity, and burn from 1 gal. to 5 gal. of oil per 24 hr. of operation, depending upon the height of flame. The fuel used is No. 1 distillate or No. 2 oil. Manual or automatic thermostatic control is available.

(Right) Thermoil enclosure. (Below) Thermoil unit, cabinet removed





# Business Statistics

**(Dotted line in charts, 1931; solid line, 1932)**

The accompanying charts, based on data supplied by the Department of Commerce, show that at least some products are equaling or exceeding last year's performance. Oil burners are closely following last year's figures; during March gas-fired boilers shortened the gap between the curves for last and this year, and this was also the case with unit heaters. Stoker installations in March are ahead of last year.

The chart on page 87 shows the trend of wholesale prices for heating and plumbing goods for the last six years, as shown by the Department of Labor index. Average prices for 1926 are taken as 100, and the price of the same selected materials compared with this average, the resulting figure being the percentage of prices for any given month as compared with 1926. As will be observed from the chart, the drop in prices has been particularly drastic during the past several months, but stabilized during March and April.

Items comprising the list for which the Department determines prices each month are: heating boilers, range boilers, radiation, water closets, lavatories, sinks, bath tubs and laundry tubs.

Indexes such as this have more value when they are compared with indexes of other commodities. The following table shows the indexes as averaged each year for heating and plumbing goods; for all building materials, and for all commodities. The latter covers 784 items, including foodstuffs, textiles, farm products, and others—in fact, all types of commodities which enter into the cost of living.

| Year | Heating and Plumbing | All Building Materials | All Commodities |
|---|---|---|---|
| 1926 | 100.0 | 100.0 | 100.0 |
| 1927 | 92.0 | 94.7 | 95.4 |
| 1928 | 95.1 | 94.1 | 96.7 |
| 1929 | 95.0 | 95.4 | 95.3 |
| 1930 | 88.6 | 89.9 | 86.4 |
| 1931 | 84.7 | 79.2 | 73.0 |
| 1932 (Apr.) | 64.4 | 72.5 | 65.5 |

It is interesting to note that heating and plumbing materials dropped more slowly in price than other commodities until this year. Between January and February, however, heating and plumbing materials dropped drastically until the index for April is lower than that for all commodities. Other building materials have not yet dropped a corresponding amount.

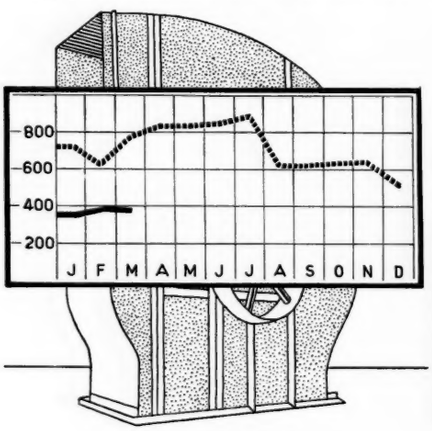
Campaigns to improve property in 200 cities have resulted in material progress in improving local business and reducing demands on relief agencies, according to a statement issued May 16 by the Committee on Home Modernizing of the Department of Commerce. A survey has revealed that about $25 million will be spent for labor and materials for this kind of work by the middle of the summer. Portland, Ore., with a pledge of over $10 million, shows the greatest activity along these lines of any city.

Among other cities reporting to the committee are Spokane and Cincinnati with pledges approximating $4½ million each; Duluth, nearly $4 million; Birmingham, Ala., $1 million.

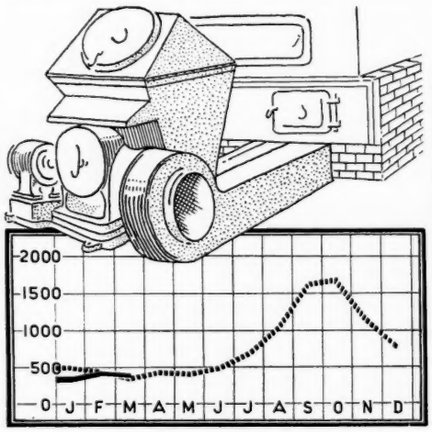
An abnormally warm heating season, in addition to the general business slump and intense competition in the domestic fuel market, was responsible for a decline in production of fuel briquets during 1931 to the lowest volume since 1924. According to figures supplied by the Bureau of Mines, the total output for last year fell to 698,316 tons, valued at $5,260,585, representing a decrease of 32.1% in tonnage, and 34.5% in value from 1930.

Approximately 55% of the total tonnage was produced in the central states, about 35% in the eastern states, and the remainder on the Pacific coast. The average price, f.o.b. plant, for the past year, was $8.11 in the central states, and $5.90 in Pennsylvania, as compared with $8.13 and $6.22 in the two localities, respectively, during 1930.

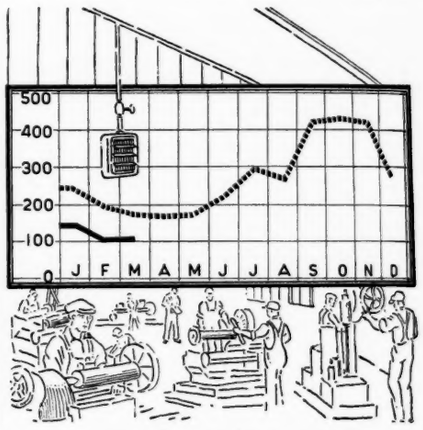
Twenty-seven plants engaged in briquetting fuel were in operation in 1931, two more than in 1930.




**Fans and Blowers**
Orders in Dollars
March, 1932, 385,199; March, 1931, 778,565; decrease over last year, 51%.




**Mechanical Heating Stokers**
In Number of Units Installed
March, 1932, 374; March, 1931, 353; increase over last year, 5.9%.




**Unit Heaters (Industrial)**
Orders in Dollars
March, 1932, 101,501; March, 1931, 175,410; decrease over last year, 42%.

Imports of briquetted fuel during 1931 decreased by about 17% from 1930. About 95% of these imports were received at Massachussetts ports, and over 85% of it was produced in Germany.

A large majority of the more than 100 prominent economists and business men questioned on the subject are in favor of a bill, sponsored by Senator R. F. Wagner, to provide for a bond issue of approximately $1 billion, to finance a construction program of already authorized Federal public works. Constructions contemplated by the bill are those which the Government is already committed to carry out, and which it normally would construct within the next few years.

The contract award rate must not be permitted to drop if confidence is to be restored in the building industry, according to E. M. Craig, Chicago, executive secretary of the National Association of Building Trades Employers.

Mr. Craig said, in a statement made April 29, that the low for the contract awards of the country as a whole must be kept above $13 million each calendar day.

"This can be accomplished," said Mr. Craig, "by a united attack on both the building and engineering construction fields. Leadership for this attack must come from the united action of governmental agencies and the various units of building industry.

"The Reconstruction Finance Corporation and the establishment of a system of federal home loan discount banks, as recommended by President Hoover, will have a very beneficial effect on private construction, not only through securing of capital for new construction, but by lending demand for much needed improvement in construction quality and methods of appraisal.

"Today the efficiency of labor is at a peak. Material costs are low, and homes can be erected at a 1915 cost level. But it is an impossible task to find available money for building purposes."

Of the thirteen districts comprising the 37 states east of the Rockies all but three showed higher construction contract totals in April than in March, according to F. W. Dodge Corporation. April contract totals for the entire eastern area showed an 8% gain over March in contrast with a loss of 9% between the corresponding two months of 1931. But only slight encouragement is offered by the current pick-up since analysis discloses that the gain was entirely due to public works, especially highways.

Metropolitan New York, Southern Michigan, and the Chicago territory were the exceptions which did not partake in the April advance over March this year. The April total for the entire 37 states east of the Rockies was nearly $122 million. Residential building formed $29 million of this total; non-residential building formed over $45 million, and public works and utilities amounted to $47 million.

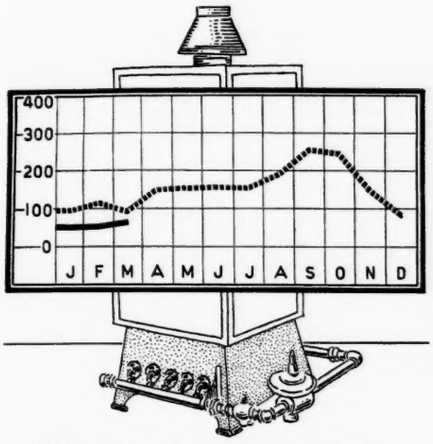
Residential building gains over March of this year were shown in the New England, Chicago, Central Northwest, Southern Michigan, St. Louis, Kansas City, and New Orleans districts. In the case of non-residential building, gains over March were shown only in the New England, Metropolitan New York, Upstate New York, Middle Atlantic, and St. Louis territories.

In public works, the April gain over March amounted to 93% while a year ago a loss of 14% was shown between March and April. For residential building, the April contract record showed a loss of almost 13% from March, and for non-residential building, April contracts were almost 8% smaller than the March awards.

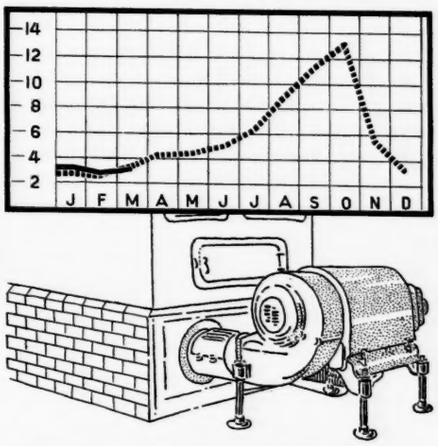
Comparative statistics of 206 manufactured gas companies for February, compiled by the American Gas Association, show an increase in number of house-heating customers from 47,149 in February, 1931, to 52,305 in February, 1932, a gain of 10.9%. Although the number of customers increased, the gas sales in M. cubic feet declined 3.6%, and the revenue from heating dropped 10.1% over the same month last year.

Figures for 212 natural gas companies, as compared with last year, indicates a drop of 0.5% in the number of domestic customers, including house-heating.

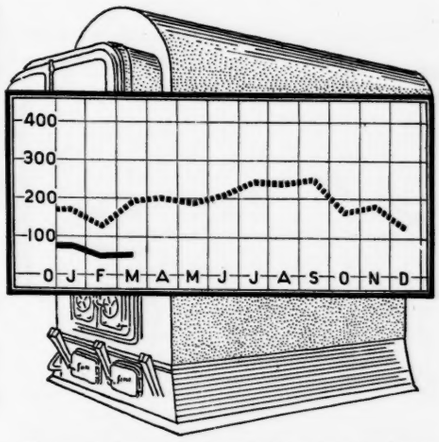
Of the manufactured territories, New England showed an increase in number of customers of 3.8%, while the east North Central states showed a gain of 1.3%.




**Shipments of Gas-Fired Boilers**
In Thousands of B.t.u. Capacity
March, 1932, 64,691; March, 1931, 95,765; decrease over last year, 32%.




**Domestic and Commercial Oil Burners**
Shipments in Number of Units
March, 1932, 3205; March, 1931, 3367; decrease over last year, 4.8%.




**New Orders for Steel Heating Boilers**
In Square Feet of Heating Surface
March, 1932, 54,899; March, 1931, 192,320; decrease over last year, 72%.

# With the Manufacturers

## Blue Coal Introduced in Chicago

During the month of May, hard coal dyed blue was introduced in Chicago for the first time by the E. L. Hedstrom Coal Company, retail coal distributor of that city.

The shipment of approximately 5000 tons of blue coal came from the Scranton mines of the Delaware, Lackawanna and Western Coal Company. It was shipped by boat from Buffalo and unloaded at North Avenue and the river, Chicago.

## New York Steam Publishes Anniversary Volume

A volume commemorating the fiftieth anniversary of the company has been published by the New York Steam Corporation. Not only the history of the company itself but also considerable historical data on steam heating and the origin of district heating are included in the book. The title is "Fifty Years of New York Steam Service."

The publication is beautifully bound, contains 135 pages, and will prove of great interest to district heating men and others interested in the history and development of steam heating.

## G.E. Enters Air Conditioning Field

The organization of an air conditioning department within the General Electric Company which will market various electrical devices for home heating, humidifying and temperature control, has been announced by President Gerard Swope. One of the first products to be marketed by this new department will be a complete oil-burning furnace.

J. J. Donovan, of Cleveland, formerly in charge of apartment house refrigeration sales, will be manager. Associated with him will be Elliott D. Harrington, of Schenectady, in charge of application engineering; J. R. Rue, of Pittsfield, in charge of manufacturing, and H. S. Woodruff, of Schenectady, in charge of design engineering. Headquarters will be maintained at General Electric's New York offices, 120 Broadway.

Elliott D. Harrington

## Anthracite Institute Laboratory Displays Equipment

An exhibition of equipment approved by the Anthracite Institute Laboratory has been opened at the laboratory's home at Primos, Pa. Equipment on display includes automatic stokers, magazine feed boilers, blower-fired installations, indirect heating systems, vacuum cleaning equipment, thermostatic controls, and a magazine feed service water heater.

A visit by the Anthracite Club of Philadelphia officially opened the exhibit, and for the occasion, several pieces of equipment were under fire and operating. A few days later, the Delaware County Real Estate Board also visited the laboratory to inspect equipment available for burning anthracite. The officials of the laboratory report that the exhibit has already proven of educational value, as well as being of aid to equipment manufacturers and dealers, and anthracite producers and retailers, in selling approved anthracite-burning equipment to prospective customers.

## R. L. Griffiths to Address Heating and Plumbing Credit Men

Credit executives of manufacturers and jobbers of heating and plumbing materials will hold a group conference, June 21, in connection with the convention of the National Association of Credit Men, to be held in Detroit, June 20-24. R. L. Griffiths, treasurer, International Heater Co., Utica, N. Y., will be chairman of the group conference. He will be assisted by the vice-chairman, L. J. Frost, Norman Boosey Co., Detroit.

Those whose responsibilities include the control of credits will be interested in the views expressed regarding installment buying and its effects upon sound credit structure. Advantages and disadvantages of installment buying will be thoroughly discussed with relation to the ex-

Exhibition floor of Anthracite Institute Laboratory

pansion or deflation of the volume of installment selling.

"The Craze for Volume at the Expense of Wise Credit Extension" will be among the discussions tending to show that credit men are becoming more "sales conscious" in analyzing credit extension as applied to volume sales. Speakers will also discuss the trend toward elimination of competition through the individual extension of credit facilities, and demonstrate why this practice has been condemned by students of credit selling.

The worth of local credit groups and methods of stimulating interest and loyalty to such associations will be explained in detail. Practical suggestions will be put forth toward instructing the group in creating a common local interest in credit information bodies.

Training customers to develop prompt pay habits is another program topic. Experiences in this

R. L. Griffiths

phase of improving credit conditions will be described. It is hoped to bring before the group definite information on credit investigation methods that will be applicable to local conditions and that may be used in any community as a basis for establishing credit limits.

## Air Conditioning of Railway Passenger Equipment†

CONTRARY to the general belief, the cost of air conditioning a passenger car is not excessive. We are going to show you very briefly how small an increase in traffic will cover all the fixed and operating charges on an air conditioning system.

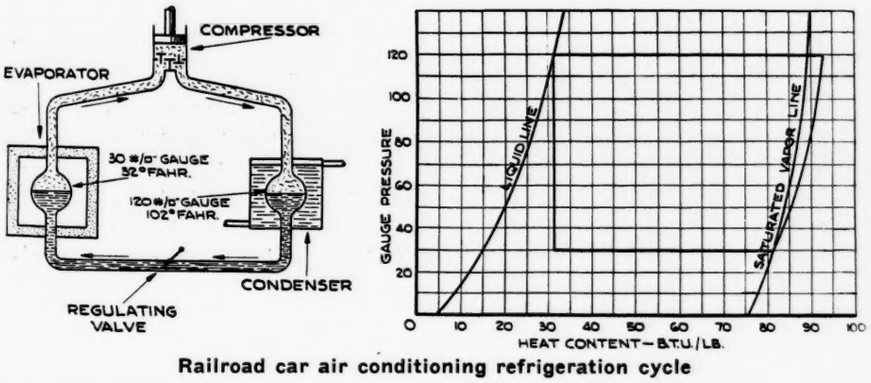
At this point we would like to interject one statement which we believe to be basically sound. This is that a profitable investment is secured not by the air conditioning of one or two cars of a train, but by completely air conditioning every car in a train. It is only by this means that air conditioned transportation can be offered. Experience with a number of air conditioned diners has tended to substantiate this statement. There is a tendency for passengers to linger over their meals for much longer periods than normal, and their reluctance to return to the warm cars cuts down the turnover on the diners and generally causes congestion. It also tends to emphasize the contrast between the cool and comfortable diner and the cars in which they must spend most of the trip.

Table 1 indicates briefly how small an increase in passengers per car will completely carry all fixed and operating charges for air conditioning equipment. The experience of one railroad with complete air conditioned trains indicated a marked increase in traffic. It does not take an increase such as this to justify air conditioning equipment as a sound investment which can pay, and will pay, large returns.

We have based these figures on a $7000 cost per car of air conditioning equipment, completely installed. This is a reasonable figure, for experience has shown that on a majority of the cars, installations can be made for less than this figure, although perhaps on some cars such as diners and business cars, it will run a bit more. An assumed life of equipment of ten years is very conservatively chosen. We have allowed $50 per year for replacements, to include such items as additional refrigerant charge for the refrigerating system, oil, etc. Based on experience, we have assumed 150 days operating period for air conditioning equipment. Under the set-up of number of passengers per car per run to pay all charges, you will notice how surprisingly small an increase in traffic will cover the charges. You can readily see from the above tabulation that as the length of run is increased, the number of passengers per car required to pay all charges becomes very small. All additional passenger traffic secured above these figures will be practically clear profit. We feel certain that you will agree with us that it is reasonable to expect at least two additional passengers a day on a 100-mile run, or one additional passenger every two days on a 500-mile run.

We have purposely presented these figures of passenger increase necessary to pay for the equipment, rather than to predict the passenger increase to show a profit. We will leave it to you gentlemen to draw your own conclusions as to the profit of such an investment.

†Abstracted from an address delivered by L. F. Bourgarde, railroad air conditioning engineer, York Ice Machinery Corp., York, Pa., before the Eastern Car Foremen's Association, New York, March, 25.




Railroad car air conditioning refrigeration cycle

## With the Manufacturers

In discussing the matter of comfort, Mr. Bourgarde presented Table 2, showing the indoor dry bulb temperatures he had observed to be comfortable and remarked that the observed inside temperatures are probably a bit higher due to the fact that lower humidities are used in his company's practice.

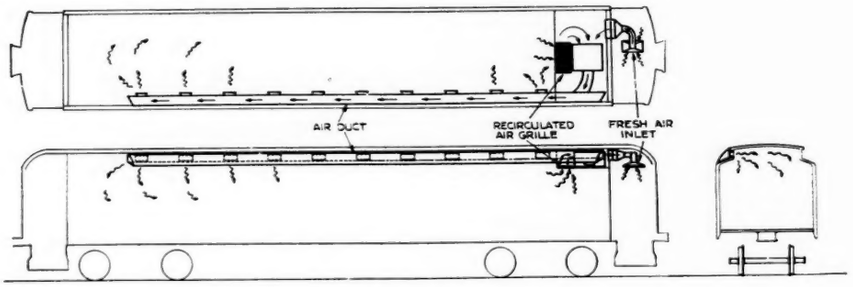
In the course of his address, the

## With the Manufacturers

speaker also listed 14 points which he considered the general specifications for a successful system: 1—low initial investment; 2—long life; 3—low operating cost; 4—low maintenance cost; 5—low supervision cost; 6—low obsolescence; 7—expensive additions to yards and terminals must be eliminated in order to keep down the investment; 8—flexibility of operation; 9—light weight; 10—small space requirement; 11—safety; 12—simplicity; 13—dependability; 14—the capacity of the cooling equipment must be great enough to keep the car at a comfortable temperature.

TABLE No. 2

| Outside Dry Bulb | A.S.H. & V.E. Inside Dry Bulb, Recommendations | Satisfactory Conditions Observed |
|---|---|---|
| 100° | ..... | 83° |
| 95° | 80.0° | 83° |
| 90° | 76.0° | 81° |
| 85° | 76.5° | 79° |
| 80° | 75.0° | 77° |
| 75° | 73.5° | 74.5° |
| 70° | 72.0° | 73° |



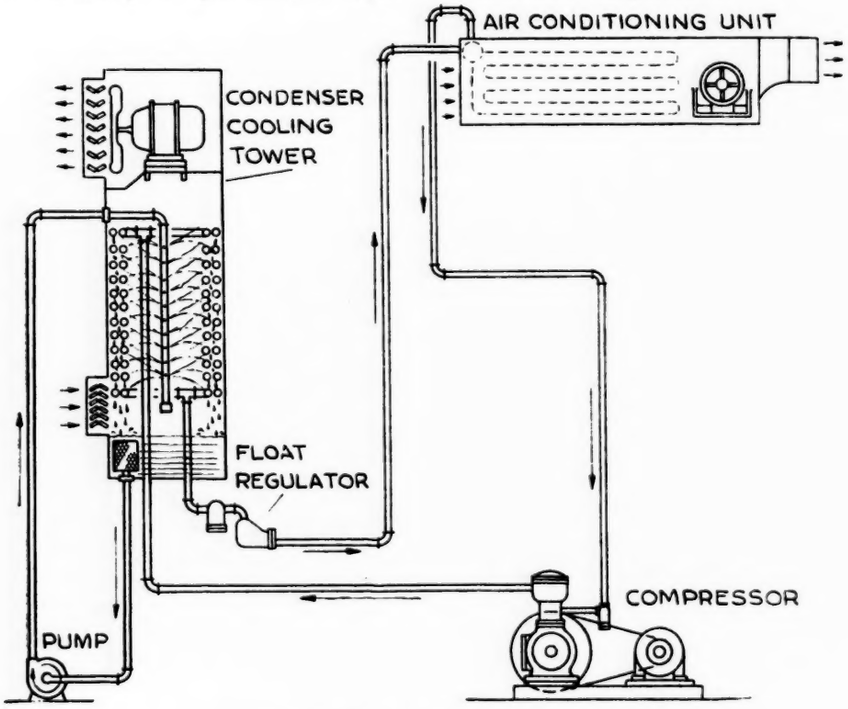

**Duct system showing distribution of air in car**

TABLE 1

NUMBER OF PASSENGERS PER CAR PER RUN REQUIRED TO PAY ALL AIR CONDITIONING CHARGES

| Length of Run, Miles | Total Fixed[1] and Operating Cost Daily | Fare per Run | Number of Passengers per Car |
|---|---|---|---|
| 100 | $6.49 | $3.60 | 1.80 |
| 200 | 6.63 | 7.20 | .92 |
| 300 | 6.80 | 10.80 | .54 |
| 400 | 6.98 | 14.40 | .49 |
| 500 | 7.15 | 18.00 | .40 |

[1] *Including interest and depreciation on investment*




**Refrigerator and air cooling unit**

*The Eureka Division* of the Ohio Pattern Works & Foundry Co., Cincinnati, Ohio, has issued catalog No. 29, illustrating and describing valves for heating and plumbing applications. Twenty pages, containing dimensional data and prices.

*Diehl Mfg. Co.*, division of the Singer Mfg. Co., Elizabethport, N. J., has issued a catalog describing exhaust fans and ventilating equipment for industrial and domestic use. Contains 16 pages of illustrations and engineering data.

*Bonney Forge & Tool Works*, Forged Fittings Division, Allentown, Pa., has issued Bulletin No. WT17, containing complete description of the engineering principles of its line of Weldolets and Thredolets. Working data, tables of sizes, and illustrations of typical installations are also included.

*Copeland Products, Inc.*, Mount Clemens, Mich., announces the appointment of Wadley, Inc., Dallas, Texas, as distributor for that territory. The Wadley company has had long experience in merchandising building and insulation materials.

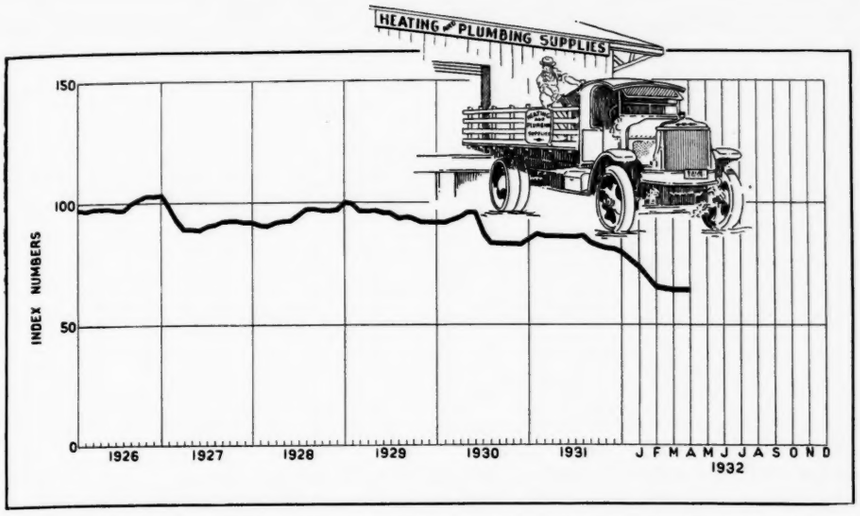
*John J. Nesbitt, Inc.*, Holmesburg, Philadelphia, Pa., has issued catalog 217 describing the Universal Duo-Luxe heating and ventilating units. It contains engineering data and installation details for schoolrooms. Standard size, 31 pages.

*Heater Division, Motor Wheel Corp.*, Lansing, Mich., has issued a 12-page catalog describing and illustrating the new M-W Gyro-Flame boiler units. There are also available two folders, one describing oil-burning domestic water heaters, and the other commercial water heaters. All are standard size.

*The Northern Blower Co.*, Cleveland, Ohio, has added Karl Gross, an authority on lead burning, lead coating and homogeneous lead work, to its staff.

*Bailey Meter Company*, Cleveland, Ohio, has issued bulletin No. 112, describing boiler water level recorders. Mechanical construction and methods of installation are outlined. Contains seven pages, standard size.

*Underground Steam Construction Company*, a subsidiary of the




**The trend of wholesale prices of heating and plumbing products, as indicated by the Department of Labor Index. Story on page 82.**

# With the Manufacturers

E. B. Badger & Sons Co., 75 Pitts St., Boston, Mass., has issued a booklet describing and illustrating numerous large steam distributing systems which the company has designed and installed. Drawings and engineering data on cast iron conduits are also included. Standard size, 16 pages.

*Aetna Ball Bearing Mfg. Co.,* 4600 Schubert Ave., Chicago, has issued a 16-page booklet, "They Shall Not Pass," containing diagrams and descriptions of applications of a recently developed oil seal for use on various classes of machinery where it is necessary to eliminate leakage of oil, grease, water, and other liquids along shafts, and to keep dirt, grit, and water out of bearings. Tabulations of sizes and dimensional data are included.

*Watts Regulator Co.,* Lawrence, Mass., is distributing a circular describing its line of boiler water feeders.

*Technical Products Co.,* Pittsburgh, Pa., has issued catalog No. 32, decribing Insa-lute cement and compounds, and containing information on industrial assembling, insulating, acidproofing, etc. Fifteen pages.

*Nelson & LoBuono,* sales engineers, 949 Broadway, New York, N. Y., are representing Bohn Aluminum & Brass Corp., Detroit, Mich., and Superstat Co., Springfield, Mass.

*The American Rolling Mill Co.,* Middletown, Ohio, has issued Armco Architectural bulletin No. 8 describing the air conditioning installation in the new Louisiana State Capitol. Seven pages, standard size.

*Bacharach Industrial Instrument Co.,* 7000 Bennett St., Pittsburgh, Pa., has issued bulletin 296, describing the operation and method of use of its optical pyrometers. Eleven pages, 8 in. x 11 in.

*The Cleveland Heater Co.,* Cleveland, Ohio is planning a one-story addition, 100 ft. x 239 ft., to its plant. L. R. Mendelson is president of the company.

*The Lincoln Electric Co.,* Cleveland, Ohio, has issued a 24-page bulletin, known as Section No. 3304, describing a complete line of supplies for arc welding. Among the new electrodes covered are one for welding high manganese steel, one for aluminum welding, one for hard or abrasion resisting welds, and a shielded electrode for mild steel. Standard size, illustrated.

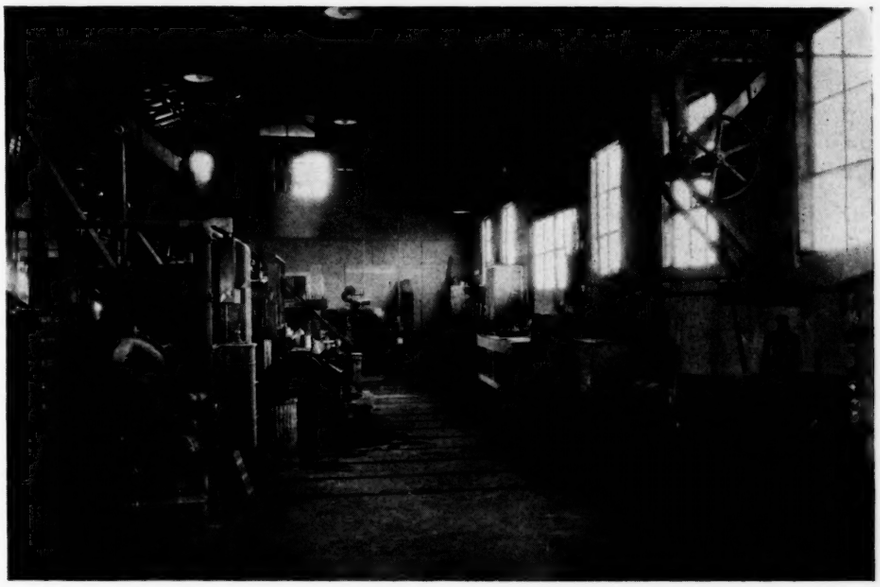
*The Eastern Foundry Co.,* Boyertown, Pa., has purchased the Peerless Heater Co., also of Boyertown, which concern will now be operated as the Peerless Heater Company Division of the Eastern Foundry Company. George L. Harberger has been appointed sales manager of the heater division.

*Jas. P. Marsh Corporation* is the new name of Jas. P. Marsh & Co., Chicago, Ill.

*Barber-Colman Co.,* Rockford, Ill., has opened an office in Pittsburgh, Pa., which will be in charge of William G. Taphorn. Mr. Taphorn was formerly connected with the Chicago office of the company.

*Bonney Forge & Tool Works,* Forged Fittings Division, Allentown, Pa., has appointed D. H. Skeen & Co., Chicago, Ill., as distributor of its line of welding fittings in the Chicago district.

*Homestead Valve Mfg. Co., Inc.,* Coraopolis, Pa., has appointed Lietz Engineering Co., Chicago, Ill., as its exclusive representative in the Chicago district.



**Testing Laboratory of The Insulite Co., Minneapolis, Minn.**

# With the Manufacturers

*Automatic Products Co.,* Milwaukee, Wis., announces its entrance into the oil burner control field. The company is planning to merchandise its equipment mainly through distributors, and has appointed Preferred Utilities Mfg. Corp., New York, as its distributor for the New England states, Eastern Pennsylvania and Eastern New York. R-O Distributors, Inc., Buffalo, N. Y., has been appointed for the territory including Western New York and Eastern Pennsylvania.

*Alco Valve Co., Inc.,* St. Louis, Mo., has recently appointed Adair C. Bovard, 610 N. Glasgow Drive, Dallas, Texas, as its representative to cover Oklahoma, Texas, Louisiana, and Southern Mississippi. Mr. Bovard also represents the Hill Manufacturing Company and Henry Valve Company of Chicago.

## Financial News

*Crane Company* directors on May 18 voted to omit the preferred quarterly dividend of $1.75, due June 15, pointing out that the dividends are cumulative and that the omission at this time is a measure to conserve cash position. The company's cash position has remained about the same since the close of 1931, when cash holdings totalled $3,692,378 and investments in government securities were $5,343,437.

*National Supply Company* and subsidiaries, including *Spang, Chalfant & Company, Inc.,* report a consolidated net loss of $1,420,761, compared with a loss of $1,186,211 last year.

*AirWay Electric Appliance Corporation* reports a net loss of $102,870 for the quarter ended March 31, against a net profit of $2,472 last year.

*Safety Car Heating and Lighting Company* and subsidiaries report a net loss of $105,872 for the year ended December 31, against a net profit of $820,860 in the previous year.

*Petroleum Heat and Power Company of New York* reports net earnings amounting to $316,820.90 for the first quarter of this year, as compared with $129,239.47 for the same period of 1931.

*Minneapolis-Honeywell Regulator Company* reports a net income, for 1931, amounting to $680,524, compared with net earnings of $979,347 for 1930. Total sales for 1931 amounted to $5,548,097, compared with $6,994,720 in 1930.

*Air Reduction Company, Inc.,* reports a net profit of $652,214, for the three months ending March 31, compared with $1,019,040 in the first quarter of 1931.

*Youngstown Sheet and Tube Company* and subsidiaries report a net loss of $3,057,736 for the quarter ended March 31, compared with a net loss of $822,909 in the first quarter of 1931, and contrasting with a net profit of $2,516,706 in the first quarter of 1930.

*A. M. Byers Company* reports a net loss of $260,322 for the six months ended March 31, against a net profit of $103,233 in a comparable period.

*Timken-Detroit Axle Company* and subsidiaries report a net profit of $328,328 for the year ended December 31, against $842,237 in the previous year.

## Changes of Address

*Combustioneer, Inc.,* has moved its plant from Goshen, Ind., to Springfield, Ohio. The general offices are located at Columbia Street and Bechtel Avenue, and the manufacturing plant at Columbia Street and Dakota Avenue.

*Heating and Plumbing Board of Trade of New York* announces that its headquarters have been moved to Room 906, 37 West 39th St., New York.

*The Ohio Electric Mfg. Co.,* Cleveland, Ohio, announces the change of address of its representative, W. G. Ellis, to 1473 Broad Street Station Building, Philadelphia, Pa.

*A. Gehri & Co.,* Eastern Division office, has moved from Baltimore to 400 N. Midler Ave., Syracuse, N. Y. F. MacDonald will remain manager of the division.

**STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF HEATING AND VENTILATING, published monthly at New York, N. Y., for April 1, 1932.**

State of New York, County of New York, ss.:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Edgar A. Becker, who, having been duly sworn according to law, deposes and says that he is the Treasurer of The Industrial Press, publishers of Heating and Ventilating and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, The Industrial Press, 140-148 Lafayette St., New York, N. Y.

Editor, C. H. B. Hotchkiss, 140-148 Lafayette St., New York, N. Y.

Managing Editor, Clifford Strock, 140-148 Lafayette St., New York, N. Y.

Business Managers, Robert B. Luchars, 140-148 Lafayette St., New York, N. Y.; Edgar A. Becker, 140-148 Lafayette St., New York, N. Y.; Erik Oberg, 140-148 Lafayette St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

The Industrial Press, 140-148 Lafayette St., New York, N. Y.; Estate of Alexander Luchars, 140-148 Lafayette St., New York, N. Y.; Louis Pelletier, 140-148 Lafayette St., New York, N. Y.; Erik Oberg, 140-148 Lafayette St., New York, N. Y.; Robert B. Luchars, 140-148 Lafayette St., New York, N. Y.; Edgar A. Becker, 140-148 Lafayette St., New York, N. Y.; Laura A. Brownell, 140-148 Lafayette St., New York, N. Y.; Franklin D. Jones, 140-148 Lafayette St., New York, N. Y.; Elizabeth Y. Urban, 163 Western Drive, Longmeadow, Mass.; Helen L. Ketchum, Atlantic Ave., Cohasset, Mass.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner: and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

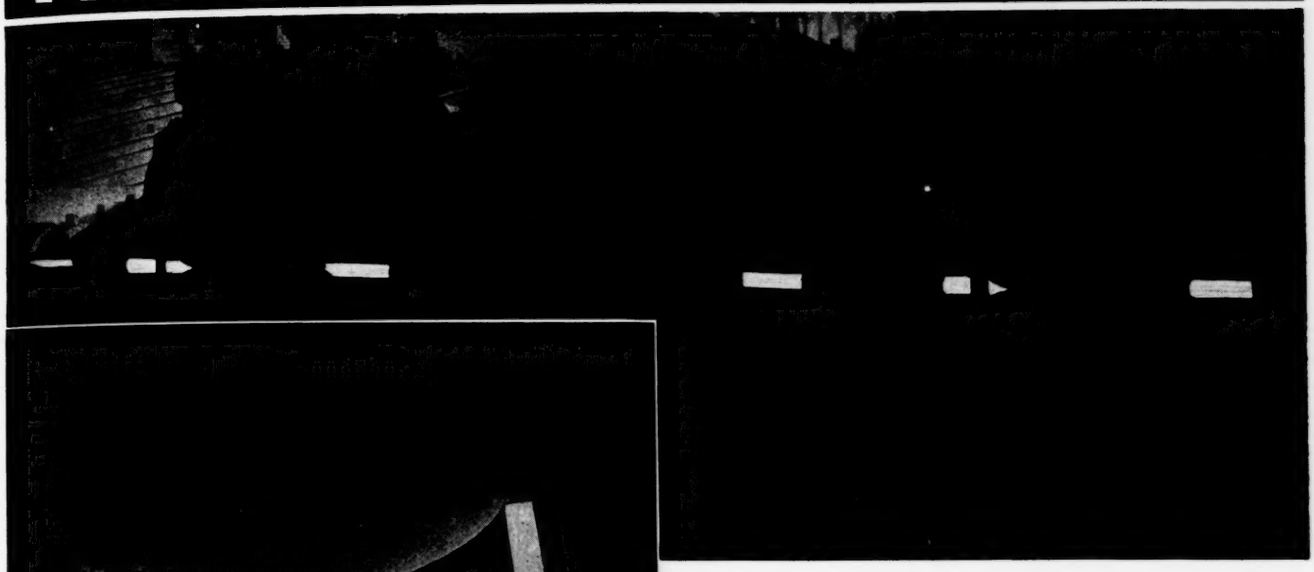
EDGAR A. BECKER, Treasurer

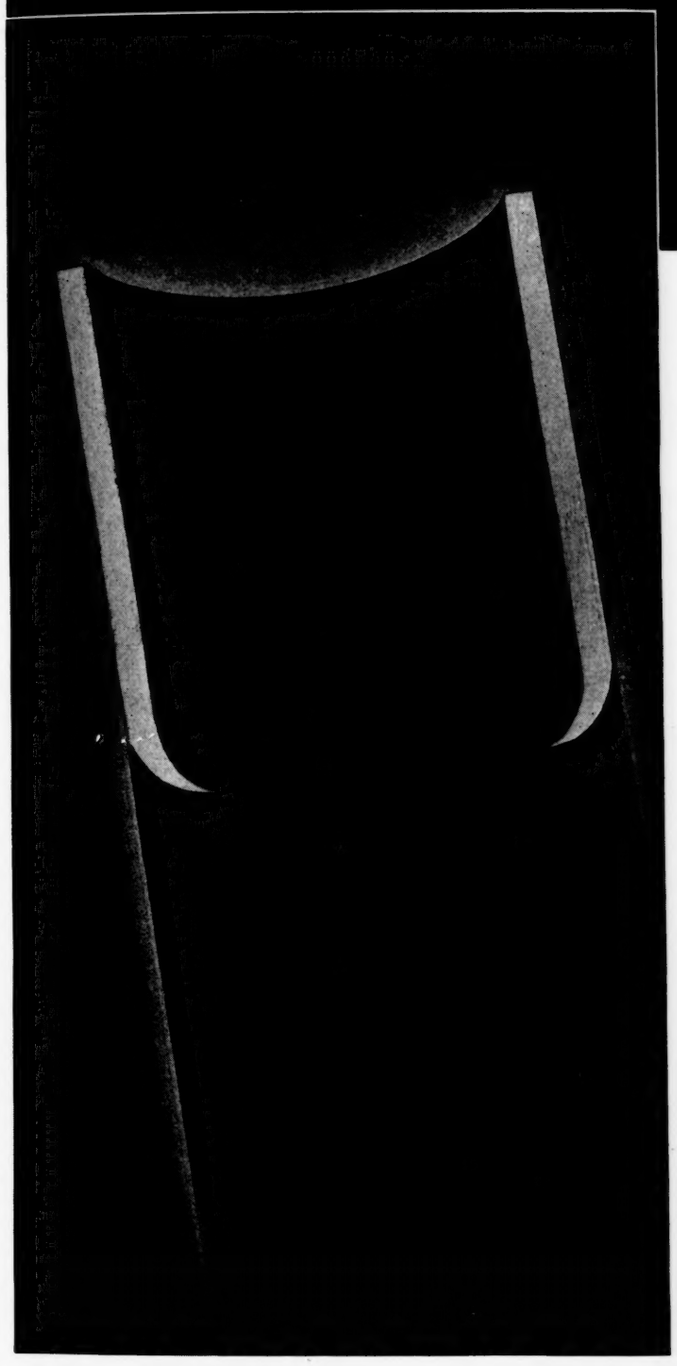
Sworn to and subscribed before me this 21st day of March, 1932.

CHARLES P. ABEL

Notary Public
Kings County No. 210
Kings Register No. 3011
N. Y. County No. 15
N. Y. Register No. 3-A-6
My Commission Expires
March 30, 1933.

# THE SCALE IS TAKEN OUT··





## AND THE PIPE LEFT SMOOTH AND CLEAN

A uniformly dense, homogeneous structure, with a smooth, clean surface means a metal of greater resistance to corrosion. "That stands to reason", as the practical user would say. Service records bear out the reasoning. And science makes clear that the experience is not accidental.

The NATIONAL Scale Free Process (applied to butt-weld pipe, sizes ½ to 3-inch), plus Spellerizing, are two definite, specific mill operations that produce this homogeneous structure and smooth, clean surface. Therefore, NATIONAL Scale Free Pipe is highly resistant to initial attacks of corrosion and quite specially to pitting. The treatment by which mill-scale is removed and the pipe wall made smooth and clean gives the user a more durable piping system for various kinds of service. The clean interior takes a more adherent galvanizing coat, while the smooth exterior gives a more satisfactory appearance, especially where enamels, bronzing, plating, or other finishes are added, or for railings and grill work.

When you buy or specify this cleaner, better-looking pipe, you do more than give preference to a visible refinement. You provide for inherent practical advantages of considerable value.

The Scale Free Process is a patented method developed by National Tube Company and applied only to NATIONAL Pipe—

***America's Standard Wrought Pipe***

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

# NATIONAL SCALE FREE PIPE

# Degree Days and Unit Fuel Consumption in Typical Cities

## April, 1932

UNIT fuel consumption figures given below must be corrected for efficiency, heat content of fuel other than that listed below, for radiation emitting other than 240 B.t.u. per hr., and for radiation calculated on a basis other than zero outside to 70° inside.

Coal is assumed as having a heat content of 12,000 B.t.u. per lb., gas, 1000 B.t.u. per cu. ft., and oil, 140,000 B.t.u. per gal. To correct for other heating values, multiply the fuel consumption listed under the charts by the standard heat content just listed, and divide by the heat content of the fuel actually being used in the installation being calculated.

For radiation installed for any other outside temperature than zero, multiply the fuel consumption given under the charts by 70°, divided by the quantity (70 minus the outside temperature used).

To correct for efficiency, divide the fuel consumption by the efficiency of the heating installation.

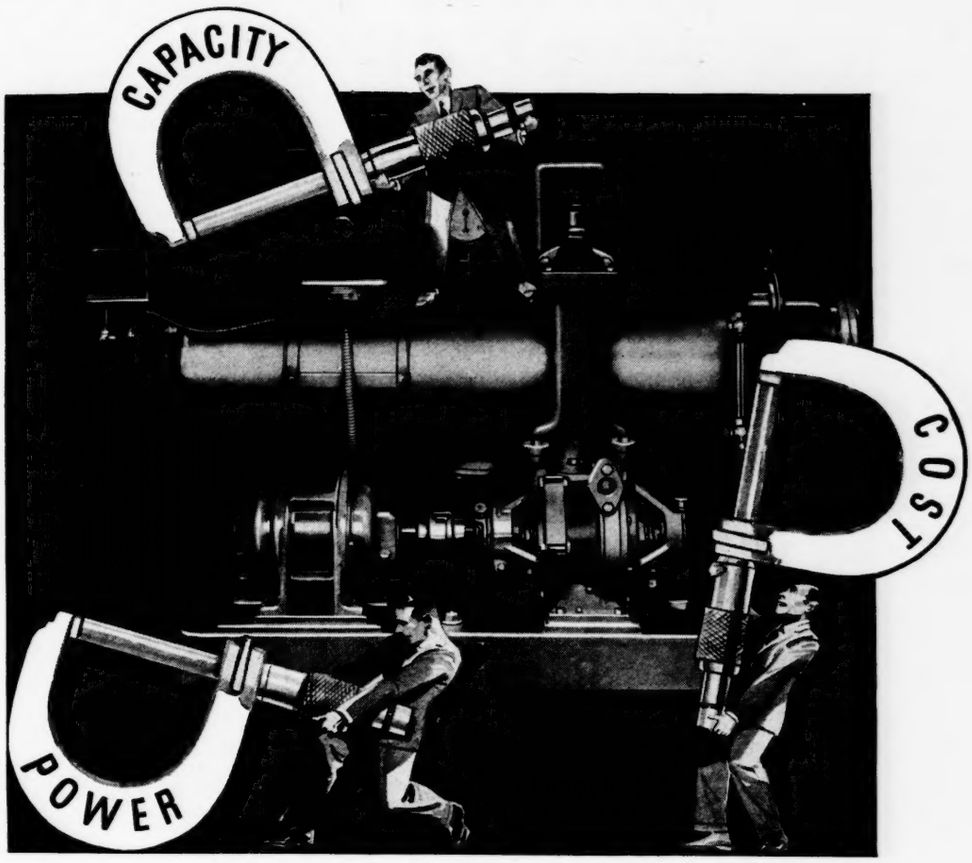
For water radiation, multiply the fuel consumption which is given for steam radiation by 5/8.

| | New York | Seattle | San Francisco | Chicago | Denver | Boston | St. Louis | Pittsburgh | Minneapolis |
|---|---|---|---|---|---|---|---|---|---|
| Degree days | 499 | 425 | 275 | 562 | 421 | 527 | 234 | 482 | 554 |
| Total degree days since September 1 | 4252 | 4444 | 2679 | 5029 | 5413 | 4894 | 3539 | 4401 | 6715 |
| Lb. of coal per sq. ft. of radiation for April | 3.992 | 3.400 | 2.200 | 4.496 | 3.368 | 4.216 | 1.872 | 3.856 | 4.432 |
| Gal. of oil per sq. ft. of radiation for April | 0.342 | 0.291 | 0.189 | 0.385 | 0.289 | 0.361 | 0.160 | 0.331 | 0.380 |
| Cu. ft. of gas per sq. ft. of radiation for April | 47.90 | 40.80 | 26.40 | 53.95 | 40.42 | 50.59 | 22.46 | 46.27 | 53.18 |

| | Los Angeles | Baltimore | Philadelphia | New Orleans | Atlanta | Cleveland | Cincinnati | Detroit |
|---|---|---|---|---|---|---|---|---|
| Degree days | 121 | 371 | 391 | 10 | 139 | 633 | 375 | 617 |
| Total degree days since September 1 | 1409 | 3377 | 3634 | 656 | 2126 | 4775 | 3958 | 5202 |
| Lb. of coal per sq. ft. of radiation for April | 0.968 | 2.968 | 3.128 | 0.080 | 1.112 | 5.064 | 3.000 | 4.936 |
| Gal. of oil per sq. ft. of radiation for April | 0.083 | 0.254 | 0.268 | 0.007 | 0.095 | 0.434 | 0.257 | 0.423 |
| Cu. ft. of gas per sq. ft. of radiation for April | 11.62 | 35.62 | 37.54 | 0.96 | 13.34 | 60.77 | 36.00 | 59.23 |

| | Buffalo | Birmingham | Indianapolis | Memphis | Des Moines | Kansas City | Louisville | Galveston |
|---|---|---|---|---|---|---|---|---|
| Degree days | 759 | 86 | 405 | 99 | 416 | 239 | 289 | 16 |
| Total degree days since September 1 | 5522 | 1766 | 4318 | 2214 | 5495 | 4108 | 3437 | 845 |
| Lb. of coal per sq. ft. of radiation for April | 6.072 | 0.688 | 3.240 | 0.792 | 3.328 | 1.912 | 2.312 | 0.128 |
| Gal. of oil per sq. ft. of radiation for April | 0.520 | 0.059 | 0.278 | 0.068 | 0.285 | 0.164 | 0.198 | 0.011 |
| Cu. ft. of gas per sq. ft. of radiation for April | 72.86 | 8.26 | 38.88 | 9.50 | 39.94 | 22.94 | 27.74 | 1.54 |

**Fuel consumption figures must be corrected for local conditions as explained above.**




# GAUGED BY *Every Standard*

## a Jennings Heating Pump gives you more for your money

•

This is no time for blind buying. Today, when you purchase a heating pump, you want maximum value for every dollar. Here's one sure way to get it. Use these three measures of heating pump worth: CAPACITY, POWER CONSUMPTION, and COST.

Jennings Vacuum Heating Pumps are noted for generous capacity. If, instead of a pump, you were buying volumes of water and air removed from the system, each dollar invested in a Jennings would purchase more.

Operating and maintenance costs, too, are less for Jennings Pumps. These efficient units consume less power; require less attention. Often they serve 10 and 15 years without repairs or replacements.

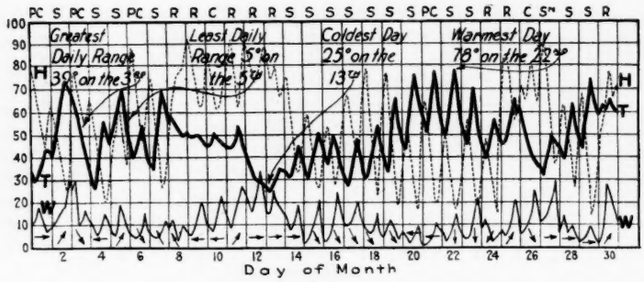
And, when it comes to selecting a pump by ratings in sq. ft. of radiation, remember this: insist on minimum power consumption and a definite air and water capacity in a given time, and you can always purchase a Jennings at a lower first cost.

NASH ENGINEERING COMPANY, 81 WILSON ROAD, SOUTH NORWALK, CONN.

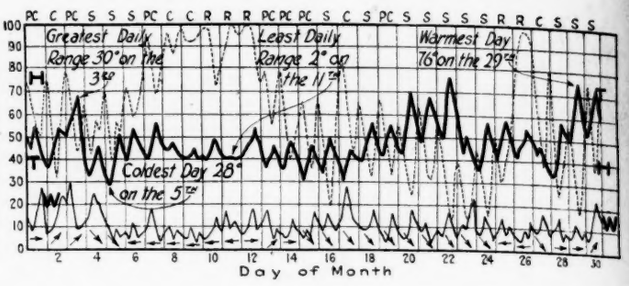
# *Jennings Pumps*

# The Weather

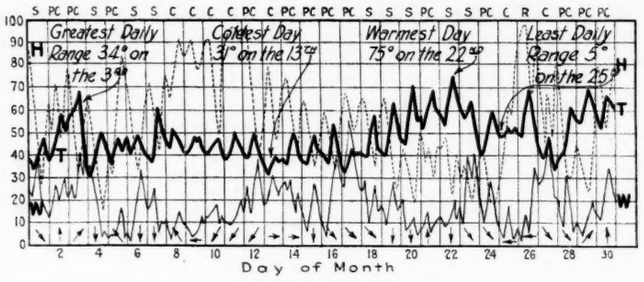
## April, 1932


Greatest Daily Range 38° on the 3rd
Least Daily Range 5° on the 5th
Coldest Day 25° on the 13th
Warmest Day 78° on the 22nd
Day of Month

Pittsburgh

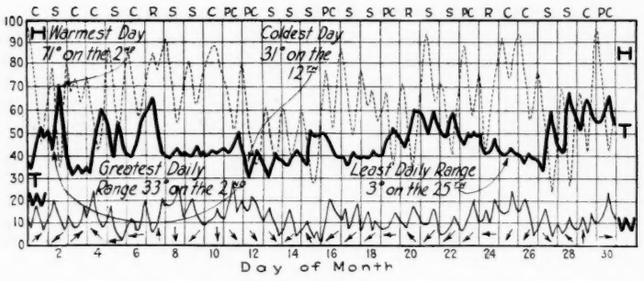

Greatest Daily Range 30° on the 3rd
Least Daily Range 2° on the 11th
Warmest Day 76° on the 29th
Coldest Day 28° on the 5th
Day of Month

Boston

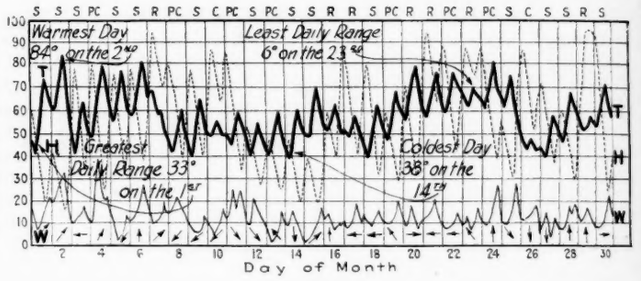

Greatest Daily Range 34° on the 3rd
Coldest Day 31° on the 13th
Warmest Day 75° on the 22nd
Least Daily Range 5° on the 25th
Day of Month

New York

*(Hourly Observation of the Relative Humidity Plotted on this Chart*


Warmest Day 71° on the 2nd
Coldest Day 31° on the 12th
Greatest Daily Range 33° on the 2nd
Least Daily Range 3° on the 25th
Day of Month

Chicago


Warmest Day 84° on the 2nd
Least Daily Range 6° on the 23rd
Greatest Daily Range 33° on the 1st
Coldest Day 38° on the 14th
Day of Month

St. Louis

| | New York | Boston | Pittsburgh | Chicago | St. Louis |
|---|---|---|---|---|---|
| Highest temperature, deg. F. | 75 | 76 | 78 | 71 | 84 |
| Date of highest temperature | 22 | 29 | 22 | 2 | 2 |
| Lowest temperature, deg. F. | 31 | 28 | 25 | 31 | 38 |
| Date of lowest temperature | 13 | 5 | 13 | 12 | 14 |
| Greatest daily range, deg. F. | 34 | 30 | 39 | 33 | 33 |
| Date of greatest daily range | 3 | 3 | 3 | 2 | 1 |
| Least daily range, deg. F. | 5 | 2 | 5 | 3 | 6 |
| Date of least daily range | 25 | 11 | 9 | 25 | 23 |
| Mean temperature for month, deg. F. | 48.4 | 47.4 | 48.9 | 46.4 | 58.0 |
| Normal mean temperature for month, deg. F. | 49.4 | 46.4 | 51.2 | 46.9 | 56.1 |
| Total precipitation, this month, inches | 2.69 | 1.67 | 1.16 | 0.58 | 3.19 |
| Total snowfall, this month, inches | Trace | Trace | 2.5 | Trace | None |
| Normal precipitation, this month, inches | 3.23 | 3.34 | 2.92 | 2.78 | 3.81 |
| Total wind movement, this month, miles | 12,204 | 7,123 | 7,798 | 8,540 | 8,768 |
| Average hourly wind velocity, miles | 17.0 | 9.9 | 10.8 | 11.9 | 12.2 |
| Prevailing direction of wind | N.W. | N.W. | W. | N.E. | S. |
| Number of clear days | 9 | 11 | 8 | 13 | 11 |
| Number of partly cloudy days | 13 | 10 | 10 | 6 | 13 |
| Number of cloudy days | 8 | 9 | 12 | 11 | 6 |
| Number of days with precipitation | 6 | 6 | 9 | 6 | 7 |
| Number of days with snowfall | None | None | 3 | None | None |
| Snow on ground, at end of month | None | None | None | None | None |

**Plotted from records especially compiled for HEATING AND VENTILATING by the United States Weather Bureau.**
**Heavy lines indicate temperatures in degrees F. Light lines indicate wind in miles per hour.**
**Broken lines indicate humidity in percentage from readings at 8 a. m., 12 m., and 8 p. m.**
**S—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.**
**Arrows fly with prevailing directions of wind.**

# Heating and Ventilating

## THIS MONTH


**Mechanical Equipment of the Long Beach Auditorium**
*Herbert Bishop Addington*

• • •

**Industrial Air Conditioning**
*George B. Bailey*

• • •

**Air Conditioning the Philadelphia Saving Fund Society Building**
*L. S. Tarleton*

• • •

**A Hot Water Heating System for a 67-Story Building**
**Part II—Hot Water System**
*J. A. Space*

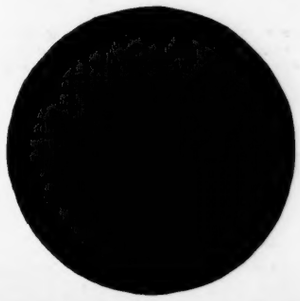
• • •

**Making the Rounds with a Service Man—Part III**
*V. D. Milliken*

• • •

**A Zoned Temperature Control System for an Industrial Utility Center**
*A. F. Hinrichsen and Chas. Hartman*

• • •

**Air Conditioning—Part XX**
**Heat Insulation and Sound Isolation**

**Editorials—Departments—Reviews**